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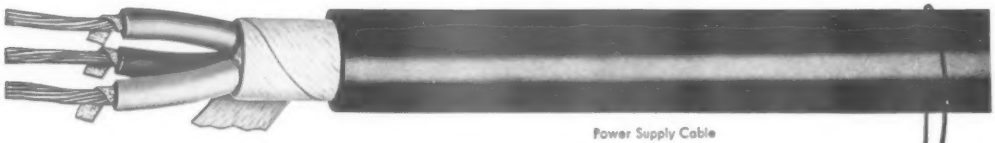

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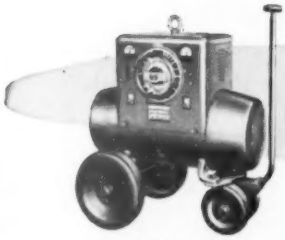

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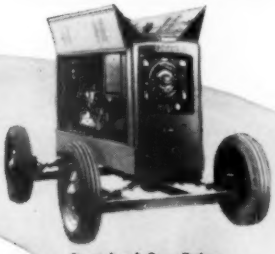

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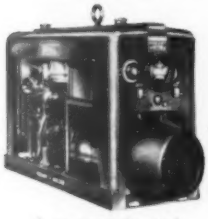

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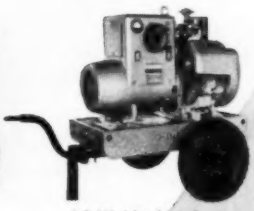

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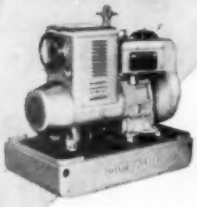
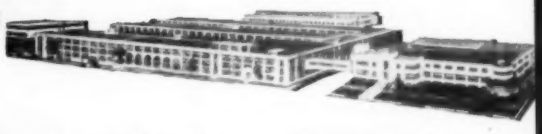
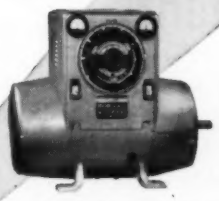


"Husky Boy" 200 Amp. air cooled



AC Transformer 180 to 500 Amp.



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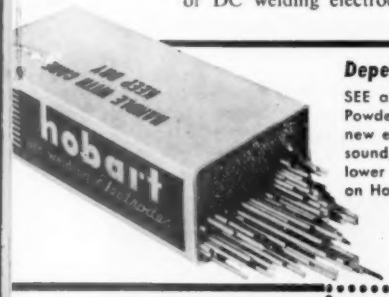

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Welding Engineer

MAY, 1957
VOL. 42—No. 5

THE MAGAZINE OF JOINING
AND SEVERING OF MATERIALS

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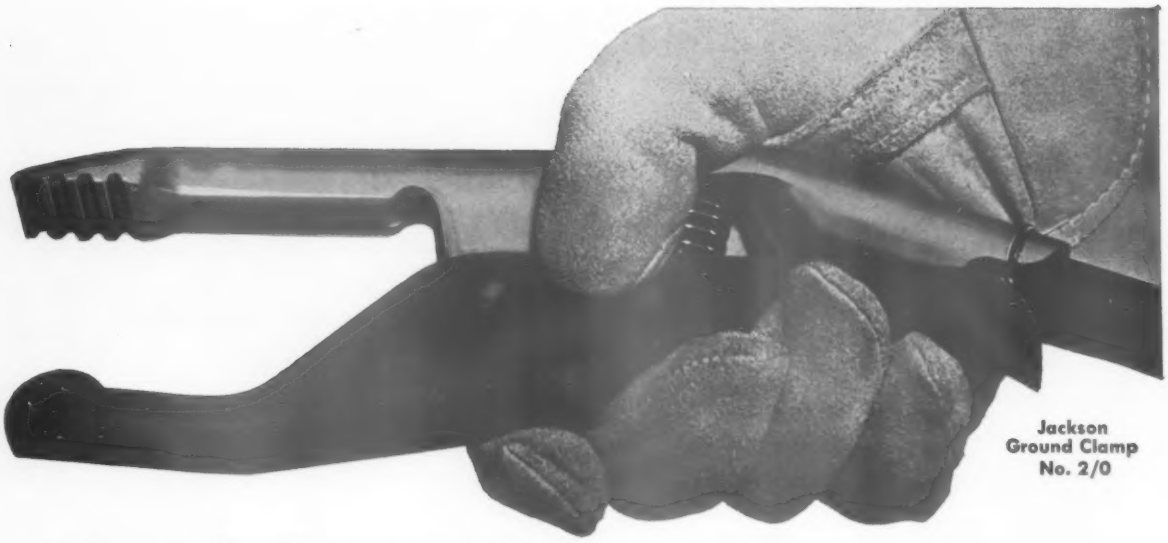

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Ground Clamp
No. 2/0

Good Grounds
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Now a convenient *hand tool* as well as a superior *electrical fitting*, the improved Jackson Ground Clamp, more than ever, goes easy *on* . . . easy *off*.

With the upper tong fitting the palm, and the lower tong fitting the fingers, the clamp opens easier and wider to grip the work. Also, the current carrying *upper* tong naturally will be placed *up*, where it is easier to make sure of firm and clean metal-to-metal contact.

The angle of the cable socket reduces strain on the cable strands. After the regular cable connection is made, it is now made possible to wire the cable insulation to the tong right in back of the socket . . . an economical means of further protecting the cable from damage.

As before, the large, flat contact area of the copper alloy upper tong provides surest conductivity between clamp and work, while the lower tong and the insulated music wire coil spring take care of sure-grip pinch.

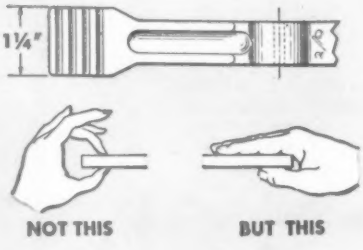
Don't let current leaks eat up your welding profits. Jackson Ground Clamps, Cable Connectors, Splicers and Lugs provide ample and secure metal-to-metal contacts to ease the flow of current, stop power losses.

Ground Clamps, Cable Connectors, Splicers and Lugs are made in three sizes:

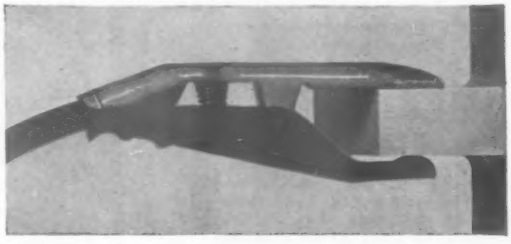
No. 1, for cables 4 thru 1/0, 300 amps,
No. 2/0, for cables 1/0 and 2/0, 500 amps
both for mechanical, brazed or soldered cable connection.

No. 4/0 for cables 3/0 and 4/0, 500 amps soldered or brazed cable connection only.

For greater metal-to-metal contact in a ground clamp, which would you choose? See below the large contact surface on the upper jaw of the Jackson.



There's less chance of damage to cable strands and insulation in the improved Jackson Ground Clamp when properly connected and placed right side up.



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MADE BY THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING ELECTRODE HOLDERS

THREE speakers at the Metropolitan AWS welding conference, relaxing for a moment, were (l. to r.) Jack Goodford of Crucible Steel Co., Ken Spicer, International Nickel Co. and J. Imperati, American Brass Co. ***(See story below.)***

TRAILER-type oxygen cylinders were transported by truck on loan. Destination: manufacturer whose supply was curtailed by a strike. The truck carries 27,000 cu ft of oxygen. ***(See story below.)***

News

New York AWS holds conference

Welding was divided into several topics at the Metropolitan Welding Conference held recently at the Midston House in New York City. The conference was sponsored by the New York Section of the American Welding Society in conjunction with the New Jersey and Long Island Sections. Discussion included low-hydrogen and and iron powder electrodes, inert gas welding, silver and bronze brazing, welding stainless piping and nickel and dissimilar alloys.

More steel for West Germany

Phoenix-Rheinrohr AG., one of western Europe's largest steel and pipe producers, plans to expand its crude steel production from 2,400,000 metric tons annually to 3,000,000 tons by 1960. The firm will invest $275,000,000 in new equipment and plants.

Airco to build near Boston

Air Reduction Sales Co. will build an air liquefaction plant at Acton, Mass., near Boston. The new facility, to cost in excess of $9,000,000, will produce liquid oxygen, nitrogen, and argon and will include distribution facilities.

Construction will begin late this spring with completion during the summer of 1958. The new plant will produce 75 tons of liquefied gases per day. Airco already maintains extensive operations at the Acton site. The new facility will replace the gas distribution station at the Airco plant, Riverton, N. J.

Expansion for Electro Refractories

Electro Refractories & Abrasives Corp. has earmarked $157,000 for expansion and modernization of its Buffalo and Canadian plants.

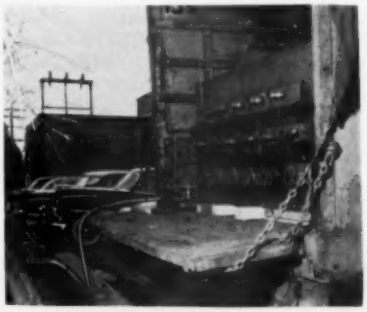
Rex Welder to Peer, Inc.

All assets of Rex Welder Co., Kansas City, Mo., have been acquired by Peer, Inc., Benton Harbor, Mich., producer of resistance welders. The move doubles Peer's production facilities, and concentrates manufacturing and engineering functions at Benton Harbor. Peer will continue to market welding equipment under both Peer and Rex brand names, with no changes in existing distributor organizations.

Strike or no, Falk gets oxygen

Inventiveness pays off, at least the Falk Corp., Milwaukee, has found it so. When a strike threatened the oxygen supply necessary for welding operations, Falk men went to work to find new sources.

Through the cooperation of Liquid Carbonic Corp., a liquid oxygen truck was obtained to transport oxygen from Canada. Tube trailers were



CLOSE-UP of oxygen truck shows hose arrangement (lower left) for removal of oxygen from cylinders into plant distribution line.

the answer for carrying gaseous oxygen. The need was imperative for at usual operating capacity, Falk consumes about 1,700,000 cu ft of oxygen per month.

Other major suppliers have also cooperated to supply Falk with various gases needed for its operations. Plans are now projected for installation of equipment for manufacture of oxygen at the Falk plant.

DEMOLITION begins on Hotel Marguery in New York City. W. M. Haile, vice president of Linde Air Products Co. makes the first cut in one of the columns. UCC will erect a 52-story home office building on this Park Ave. site.

FOUR burning stations are in constant use at scrap metal firm. Entire flame-cutting operation has switched to propane burning. *(See story below.)*

Crucible Steel opens new facility

Crucible Steel Co. was host recently at the official opening of its new specialty steel warehouse and sales office, 6033 E. Bandini Blvd., Los Angeles. The two-story building is sheathed with stainless steel sheet.

Miller to hold Chicago Piperama

H. K. Miller Inc. will hold Chicago's first "Piperama" on May 23 and 24. The spotlight will be on a demonstration of Hobart Bros.' new stress-relieving unit. This 400-cycle unit will be shown at the Miller showrooms at 7426 S. Halsted, Chicago, where it will be put to test by representatives of some of the nation's largest pipe-welding firms.

A complete line of welding machines and electrodes will be on exhibit and tours will be conducted through the welder repair shops. Refreshments will be served to all comers. Admittance is by invitation only.

Du Pont presents testing award

Recipient of the first Du Pont Nondestructive Testing award—a golden bronze medallion on an engraved antique bronze wedge base—is Eric A. Kolm. The award was established by E. I. Du Pont de Nemours & Co. for an outstanding contribution to the field of nondestructive testing. It was presented to Mr. Kolm at the recent meeting of the wetern section of the Society for Nondestructive Testing in Los Angeles. Mr. Kolm developed improved welding techniques and designed new welding equipment for vacuum tubes using X-ray examination.

AUTOMOTIVE industry's first all-aluminum unitized vehicle body, another welded "first," was unveiled less than two weeks ago by Ford Motor Co. Ford engineers, working with Kaiser Aluminum's automotive engineers and Army Ordnance, designed and built the body for a new experimental military general-purpose vehicle. Spot welded throughout, body and frame structure weighs only 124 lb. For complete fabrication details see the June issue of WELDING ENGINEER.

LP-gas system for scrap cutting

Scrap Disposal Co., National City, Calif., has switched to an LP-gas system for flame-cutting scrap metal. The firm now uses propane combined with oxygen. The system utilizes a large storage tank with an underground system to carry fuel to four major cutting stations in the scrap yard.

A 12,000-gal (*water*) tank holds 10,700 gal of propane; a bulk storage trailer holds 10,000 cu ft of oxygen and a bank of 35 cylinders (220-cu-ft capacity) is available as reserve. The firm also uses a special LP-gas torch for cutting. Scrap Disposal has found the new system, installed by American Liquid Gas Corp., to be economical.

Paris Fair is host to world

The 46th annual Paris International Trade Fair, to be held in Paris, France, May 25-June 10, will see 4,000,000 visitors from all parts of the globe. There will be over 13,000 exhibitors from 39 countries exhibiting products, including manufacturers of welding equipment and supplies.

Olin Mathieson acquires cable firm

Olin Mathieson Chemical Corp., has acquired assets of Southern Electrical Corp., Chattanooga, manufacturer of aluminum wire and cable. Southern Electric will operate as part of Olin's aluminum division. There will be no changes in existing functions.

(Continued on page 107)

no successful improvements have ever gone contrary to the laws of nature...

Man has improved many things but every progress he has achieved followed the basic blueprints of mother nature. For hand cutting, for instance, no matter where one places the high pressure oxygen valve lever, one may not do better than to follow the natural design of man's hand.

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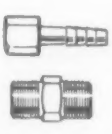
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Soldering, Brazing Equipment

Safety Equipment

Cutting Equipment

Accessories

Letters should be addressed to: The Editor, WELDING ENGINEER, 12 E. Grand Ave., Chicago 11, Ill. No letter will be published unless signed, but your name will be withheld if requested.

Results count

Dear Sir:

I read with interest the comments of Harold Hicks on iron powder electrodes ("Iron-powder 6024's are no panacea," Feb., p. 41.) I find I agree with the statement that "descriptions of the new type sound like a sales pitch on a new auto model." I have thought for years that electrode manufacturers should describe their products honestly.

I have been welding for 25 years (structural steel and pipe) and I still have much to learn. Only too often an electrode salesman stops at my firm and delivers his pitch: "With any source of power, one hand and partial vision in one eye and ten minutes practice with this electrode, anyone can make a first class weld on rusty dirty steel, with poor or good fit-up, in any position, with no trouble at all."

As a friend of mine feels, anyone can throw a baseball but when you earn your living throwing a baseball you have some learning to do.

Jack Shanahan
Shanahan Welding Co.

That popular home

Dear Sir:

Congratulations for the best informative welding magazine a weldor can buy!

By the way, I was interested in the article on welded steel homes in the May, 1956 issue and would like to have addresses of firms supplying such steel.

Joe Skora
Gary, Ind.

—The addresses of three such firms have been forwarded.

. . . The halls of fame are open wide
And they are always full;
Some go in by the door called "push,"
And some by the door called "pull."

—Anon.

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ROBOTRON POINTS THE WAY TO PROGRESS

30 YEARS AGO

(Taken from *The Welding Engineer* of May, 1927)

An early radio advertiser is Broadway Metal Weld Co., Denver, broadcasting its sales story from a local radio station.

— 30 YEARS AGO —

At the annual dinner of the American Welding Society in New York City, president F. M. Farmer announced the establishment of the Miller Medal, the gift of Samuel Wylie Miller.

— 30 YEARS AGO —

Royal D. Malm has been appointed western district sales manager by The Lincoln Electric Co., Cleveland. He will headquarter in Chicago.

— 30 YEARS AGO —

The American Brass Co. has opened an office in Newark, N. J., with J. B. Benedict and L. B. Smith in charge.

— 30 YEARS AGO —

New products on the market include a tubular electric furnace for heat treating—without heating elements and an underwater cutting torch. The torch, interestingly enough, was developed by Commander Ellsberg who reached fame by commanding the reclamation of the submarine **U.S.S. S-51.** Underwater flame-cutting played an important part in raising this vessel from a depth of 135 feet under water.

— 30 YEARS AGO —

The most practical golf tee box, recommends the editorial page, is one of welded steel. It is a simple matter to weld a partition making compartments for sand and water. A welded-steel tee box will not only endure but it will "demonstrate the multitudinous uses of welding to the uninformed on the golf course."

—30 YEARS AGO—

Linde Air Products Co., New York City, will begin construction of a new oxygen-producing plant at Amarillo, Texas, in the near future.

—30 YEARS AGO—

Wodack Electric Tool Corp. has moved into its own building at 4627 W. Huron St., Chicago. Mr. Oscar P. Wodack is the owner.

Solve Your *Special* Resistance Welding Problems with Mallory *Standard* Electrodes

BEFORE you pay the extra price of special electrodes, both in added cost and longer delivery, it pays to check the many types available as standard from Mallory.

In the Mallory standard list are literally hundreds of designs . . . all available promptly, manufactured by existing tooling. Many are carried by Mallory distributors for immediate delivery. Included are cold formed single and double bend types—cast and forged off-set designs—a wide choice of nose shapes, tapers and lengths—and models with Mallory's special fluted cooling hole, for efficient cooling right up to the electrode face. All are made from the specialized alloys and by the precision manufacturing methods that Mallory has developed during more than thirty years of resistance welding leadership.

Your local Mallory Welding Distributor can lend valuable help in working out ways to use this broad line of electrodes to solve "special" problems at "standard" prices. And he can give you prompt delivery, usually from his local stock, of exactly the electrodes you need. Write to us today for the name of the Mallory Welding Distributor nearest to you.

Over 30 Years of Resistance Welding Leadership

In Canada, made and sold by Johnson Matthey and Mallory Ltd., 110 Industry Street, Toronto 15, Ontario

Serving Industry with These Products:
Electromechanical — Resistors • Switches • Tuning Devices • Vibrators
Electrochemical — Capacitors • Mercury and Zinc-Carbon Batteries
Metallurgical — Contacts • Special Metals • Welding Materials

Expect more . . . Get more from

P. R. MALLORY & CO. Inc.

MALLORY

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio

HARRIS TORCHES reduce fuel costs 97.01%

Cutting steel risers at the Unitcast Corporation of Toledo, Ohio was a costly and time consuming operation. In an effort to solve this problem, Unitcast recently replaced fifty torches with equipment from Harris Calorific for use with natural gas.

These Harris torches are unique in that torch and tip are *both* designed for use with natural gas. As a result, fuel costs have been reduced from 77¢ per hour to .023¢ per hour. Also, the time required for a single operation has been reduced 13%.

The additional savings of the costly storing of carbide, charging the generator and sludge disposal have convinced Unitcast Corporation that there is no more economical . . . or efficient method of flame cutting than with Harris Calorific torches and natural gas.

Harris Calorific salesmen are well trained specialists who can help you solve your flame cutting problems. They have complete information to answer *all* your questions about gas welding and cutting equipment.

Call or write today!

HARRIS

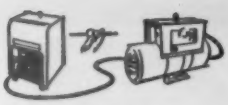
HARRIS CALORIFIC CO.

5501 CASS AVE. • CLEVELAND 2, OHIO

MAY
1957

Your *Weld World* at press time

Last minute news of interest to those engaged in joining and severing materials.



..Attention welding equipment manufacturers: The Department of Defense is preparing a directory of firms that make welding equipment. If you haven't already returned your questionnaire, you are urged to do so immediately. Replies should be sent to: Oscar Peters, Office of Assistant Secretary of Defense for Supply and Logistics, Pentagon Bldg., Washington 25, D. C.

..Du Pont Co. has established four separate grades of hyper-pure silicon at generally lower prices. Grade No. 2, recommended for use in welders, is now priced at $250 a pound. Grades are based on boron content—the most critical impurity in silicon.

..Union Carbide Corp. is new, shortened name adopted by Union Carbide and Carbon Corp. Linde Air Products Co. is now simply Linde Co.

..Work resumed last month at Huntington (W. Va.) Works of International Nickel Co. after a 76-day strike by members of United Steel Workers.

..Industrial abrasives is a new course to be offered by New York University this fall. Said to be first by an accredited college, the $25 course will be open to all in abrasives field.

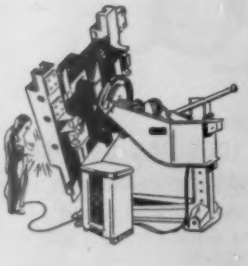
..Linde oxygen-plant strike, along with cost-price squeeze, cost Union Carbide about $1.5 million in earnings during first quarter of 1957. As this was written, strike was entering its fourth month. Argon users are still hardest hit.

..That old barometer of steel prices, the cost of scrap, dropped to $42 per ton—$25 lower than at beginning of year. Nevertheless, steel prices are still expected to rise July 1. So far no evidence of a rush to buy before then.

..Demand for aluminum is expected to increase in months ahead. Some users have been living off their inventories for past several months.

.. Economic outlook continues rosy, despite some qualms about automobiles and home construction. Total construction is still high because of commercial and industrial buildings, churches, schools, etc.

..Odds against a tax cut this year are about even. "Modern Republicans" would like to wait until next year, so administration can take credit in 1958—an election year. Democrats would like to anticipate them, get credit themselves.



..With England getting tax cut, ending draft, more pressure will be put on Congress for tax relief, reduction in expenditures.

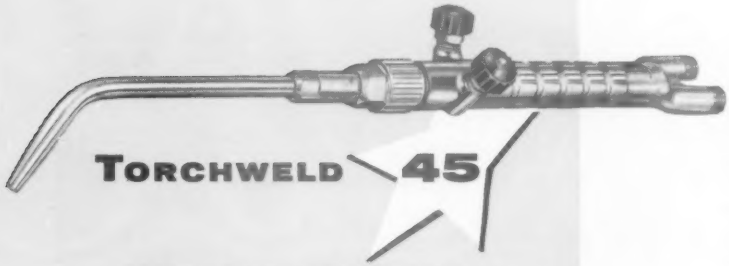
..Fast tax write-offs are target of budget cutters in Congress. They (along with administration) want fast write-offs stopped. One exception: where research on new weapons is concerned.

..Use of oxygen to speed steel making processes is increasing, with mills expected to set new consumption record this year.

THE WIDE-RANGE, ALL-PURPOSE WELDING TORCH

This is the torch *par excellence* for all types of work, from 28 gauge sheets to 1" slabs or more. Has easy-adjustment non-seizing valve mechanism for precise control of gas pressure and flow. Mixer blends gas perfectly, delivers to tip without restriction. Both swaged and drilled tips are available to provide required flame characteristics.

Rugged, tough stainless steel tubes . . . silver-brazed at head and base. Lightweight, strong brass handle, grooved to give sure grip and control. Mixer has buna seating rings for leakproof hand-tightening. No metal-to-metal contacts. No scratching or scoring. No costly reseating of torchhead.



THE LIGHT AND MEDIUM DUTY WELDING TORCH

For automotive welding, pipe welding, sheet metal fabrication, steam-fitting, etc. Aluminum handle, lightweight but rugged. Valve wheels placed conveniently at front end, under the thumb. Mixer delivers perfectly mixed gases. Mixer has buna seating rings for leakproof hand-tightening.

FAMOUS BANTAM® WELDING TORCH

Ideal for welding aluminum, alloys, aircraft tubing, steel from 28 gauge to ⅛" thick. Lightweight, easy to handle, compact for use in tight quarters.

Valve wheels placed conveniently at front end, under operator's thumb. Special nickel alloy tubes, silver-brazed at head and body. Non-seizing, non-scoring stainless steel valve stems. Mixer designed for perfect gas mixing.

TORCHWELD®

The All-Star Line of Welding and Cutting Equipment

In this outstanding line of regulators, torches, tips and accessories you will find features galore. Operating features that boost production, handling features your operators go for: cost-cutting features, durability and dependability. All backed by a great manufacturing and engineering organization and a nation-wide network of dealers offering prompt service in every respect. Ask your nearest authorized NCG dealer or NCG office for a demonstration. Or write for a complete catalog.

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840 NORTH MICHIGAN AVENUE, CHICAGO 11, ILLINOIS
Branches and dealers from coast to coast

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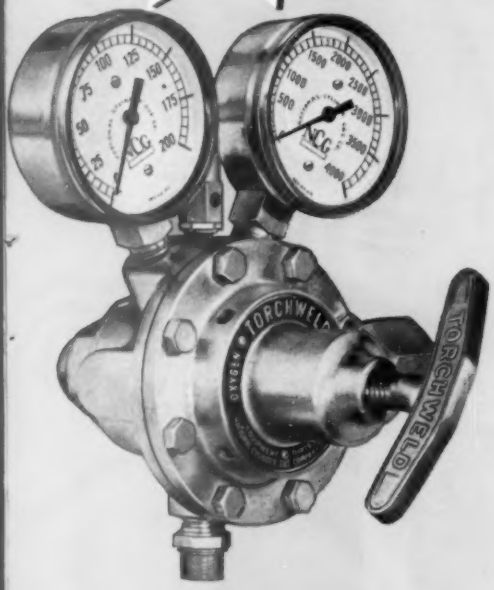
TORCHWELD 6500 Regulators



TWO STAGE PERFORMANCE AT SINGLE STAGE COST

The best features of both types of regulators—the *dis*advantages of neither . . . that's what you get in the 6500 Series Regulators. That's because of the patented pressure compensating chamber. It maintains desired set pressure *throughout the usable cylinder range!* Yes, here's simple construction, low initial cost, and the precise control of pressures and volumes found elsewhere only in the more expensive two stage regulators.

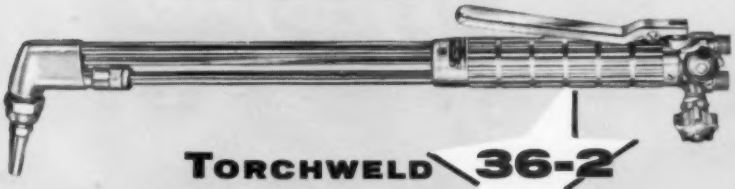
TORCHWELD 75-1

THE OUTSTANDING CUTTING TORCH

This is the ideal performer for operations of any size or any kind, from small shop to huge mill. Cuts sections up to 16 inches thick.

Pressure-forged, rugged brass valve body; non-seizing stainless steel needle valve stems. Non-warping forged bronze or abuse-resistant nickel alloy heads. Nickel-alloy tubes, set in self-reinforcing triangular formation. Silver-brazed into handle and head. Precision-swaged tip orifices for perfect gas flow and clean, sharp kerfs.

Long control lever, equipped with exclusive *packless* valve. Gives positive smooth control even at lowest rates of flow. Pre-heat gases are blended in tip.



TORCHWELD 36-2

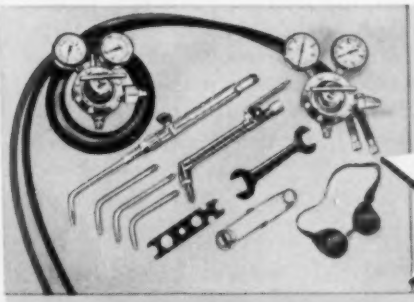
SPECIAL CUTTING TORCH FOR WIDE RANGE OF GASES

A medium pressure pre-mix type cutting torch designed for use with propane, butane, natural gas and city gas as well as acetylene. A fast economical cutter, its capacity ranges up to 16 inch sections.

Top or bottom lever, 75° or 90° forged bronze head. New packless type valve, far outlasts conventional types. Better control and smoother flow of cutting oxygen. Universal type silicon-bronze mixer. Precisely blends preheat gases through entire range of tip sizes. Nickel-alloy tubes, silver-brazed to head and body. Rugged, heavy-duty brass handle, grooved for sure grip and control.

SOD-R-BRAZE® ACETYLENE-AIR TORCH

An efficient, economical soldering, heating and light brazing torch . . . perfect for plumbing, refrigeration, automotive, electrical, maintenance and repair work. Three-way thumb control. Operator turns on and off, adjusts flame and sets pilot light—all with a flip of the thumb. Tips have individual mixers. 6 different sizes for a wide range of work.



TORCHWELD READY-TO-USE OUTFITS

A wide range of ready-to-use complete outfits for every welding and cutting need in every type of shop or plant. All needed accessories are included. Outfits cost less than the total price of components when bought separately.

TORCHWELD CUTTING ATTACHMENTS

Cutting attachments are available to convert each welding torch into an efficient, highly productive cutting torch. Doubles the usefulness of your welding torch.

Here's the Easy Way

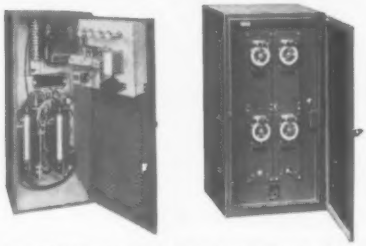
TO A BETTER WELDING INSTALLATION

• Whether you start from scratch or expand an existing operation, your Square D Field Engineer has two important things to offer to make your job easier.

First, he has the background which enables him to offer sound counsel at the planning stage. Second, he is backed by a complete line of performance-proven electrical equipment with which to put practical planning into action.

Field Engineers are available through Square D branch offices in all principal United States cities—and in Canada, Mexico and England. Backing up these engineers are the design and manufacturing facilities of 14 strategically located Square D factories and the localized services of a nation-wide network of authorized electrical distributors.

SQUARE D DOES THE *Complete* JOB!

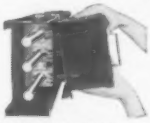


ELECTRONIC and MAGNETIC WELDER CONTROL

SUBSTATIONS

SWITCHBOARDS

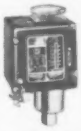
FEED-IN DUCT



PLUG-IN DUCT

SAFETY SWITCHES

LIMIT SWITCHES

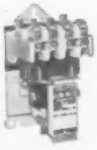


PRESSURE SWITCHES

4-WAY VALVES

PUSHBUTTONS

SELECTOR SWITCHES



CONTROL RELAYS

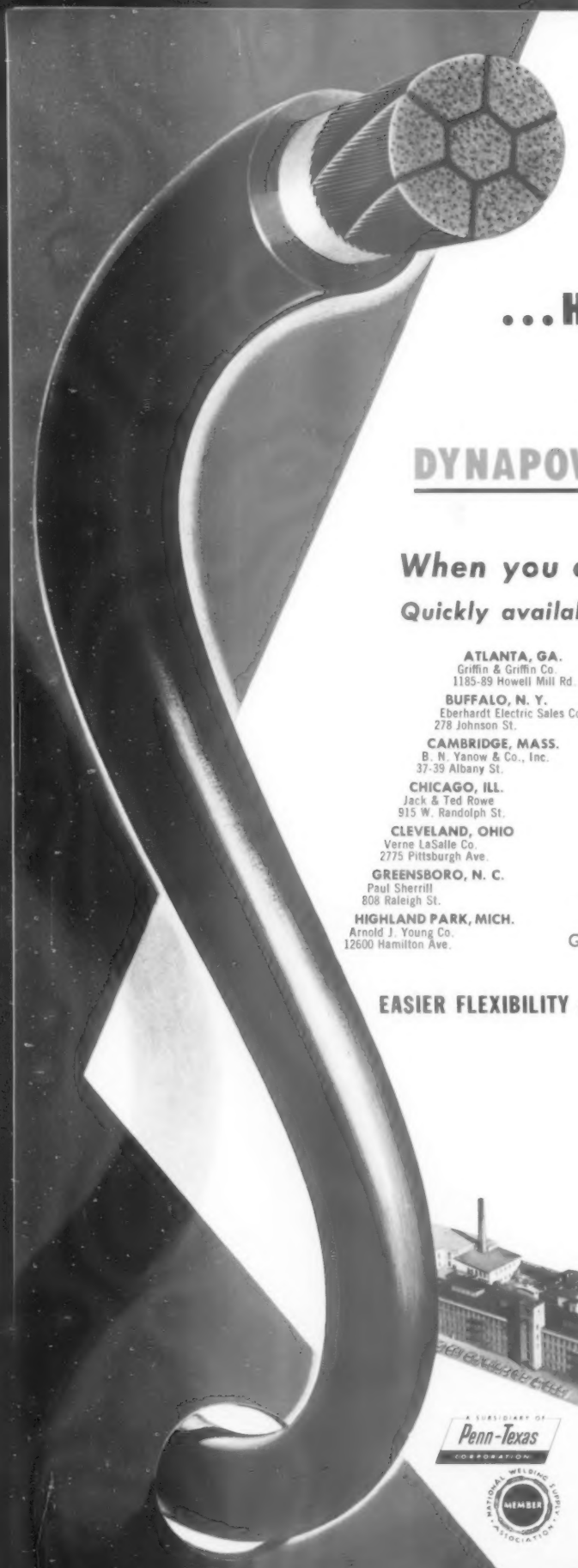
FOOT SWITCHES

PILOT LIGHTS

NOW...EC&M PRODUCTS ARE A PART OF THE SQUARE D LINE

SQUARE D COMPANY

ASK THE MAN BEHIND THE GLOVE...
CAROL AWG 4/O NEOPRENE WELDING CABLE
CAROL AWG 4/O NEOPRENE WELDING CABLE



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Quickly available from any of these warehouses!

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how's this for performance?

15 lbs. of scrap after cutting 156 parts from a 6′ x 10′ plate of ⅜″ steel

Using four torches guided by an electronic tracer, an Airco #48 Duograph automatically flame cut 156 parts from a ⅜″ x 72″ x 120″ steel plate. Of the original 918 pounds of sheet steel, only 15 pounds of scrap remained. Discover the advantages to be gained by using Airco flame-cutting machines for fast, economical production. In addition to the #48 Duograph, Airco flame-cutting machines include the Airco Travograph, Oxygraph, Duograph, Monograph, Camograph, and Radiagraph. Write Airco for complete information and literature.

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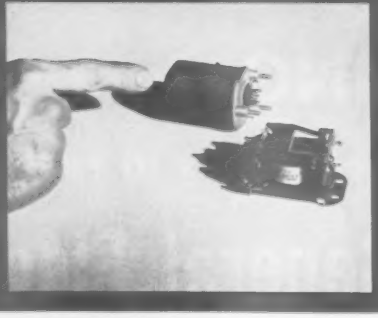
Products of the divisions of Air Reduction Company, Incorporated, include: AIRCO — industrial gases, welding and cutting equipment, and acetylenic chemicals • PURECO — carbon dioxide — gaseous, liquid, solid ("DRY-ICE") • OHIO — medical gases and hospital equipment • NATIONAL CARBIDE — pipeline acetylene and calcium carbide • COLTON — polyvinyl acetate, alcohols, and other synthetic resins.

NOW G-E RESISTANCE-WELDING CONTROLS come in two lines to meet *any* non-synchronous application. *Standardline* combinations—using standard NEMA sequence timers—are specifically for normal welding applications. *Customline* combinations use unit timers to provide any control sequence needed on special-purpose, multi-electrode, or automated machines.

4 **CIRCUMFERENTIAL ARRANGEMENT** of circuit components permits easy accessibility and quick replacement.

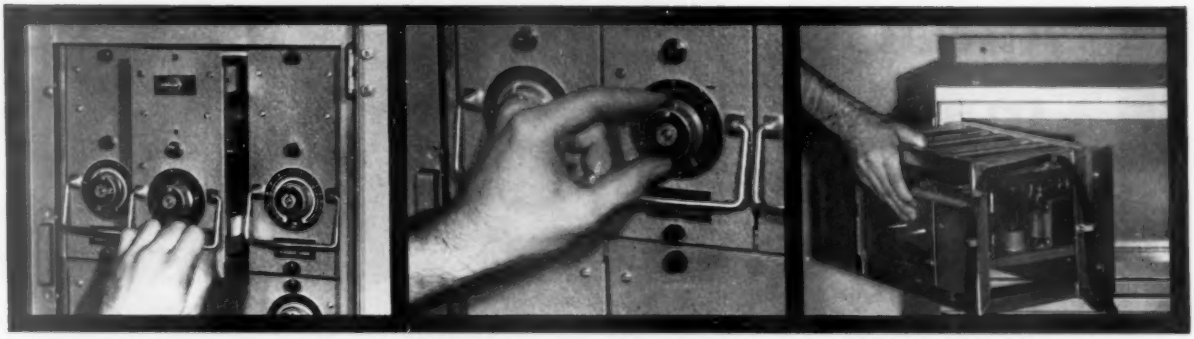


5 **HERMETICALLY SEALED RELAYS**—another G-E exclusive—eliminate dirt, moisture and corrosion problems.

6 **FLUSH-MOUNTED ACCESS DOORS** on front and side of enclosure increase accessibility to units and circuitry.

Specify General Electric's NEW *cost-cutting* non-synchronous controls for your next resistance welding application. For more information, write to Section 794-1, General Electric Co., Schenectady, N. Y., for bulletins GEA-6408 (Standardline) and GEA-6593 (Customline). *Specialty Control Dept., Waynesboro, Va.*

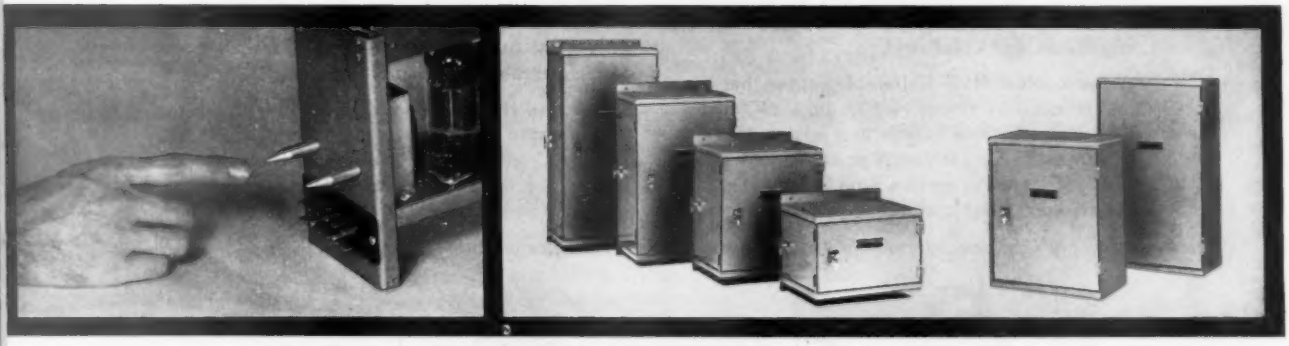
8 reasons why General Electric's new full line of non-synchronous controls can cut your resistance-welding costs



1 **DRAWER-TYPE PLUG-IN UNITS**—used throughout—provide you complete flexibility and greater accessibilty.

2 **EXPANDED DIALS**—easy to read—permit accurate setting of short time cycles for consistent weld results.

3 **SWING-OUT FRAMES**—exclusive General Electric feature—speed installation, inspection and maintenance.



7 **TAPERED GUIDE-PINS**—part of the timer—assure positive alignment, speed installation and replacement.

8 **FULL-LINE SELECTION**—choice of 4 control cases and 2 contactor cases—means you can buy for present and future needs! "Building-block" design gives maximum flexibility for assembly of combinations, a simple way to add control.

Progress Is Our Most Important Product

GENERAL ELECTRIC

NOW G-E RESISTANCE-WELDING CONTROLS come in two lines to meet ***any*** non-synchronous application. ***Standardline*** combinations—using standard NEMA sequence timers—are specifically for normal welding applications. ***Customline*** combinations use unit timers to provide any control sequence needed on special-purpose, multi-electrode, or automated machines.

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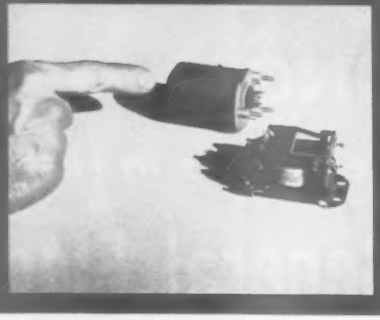

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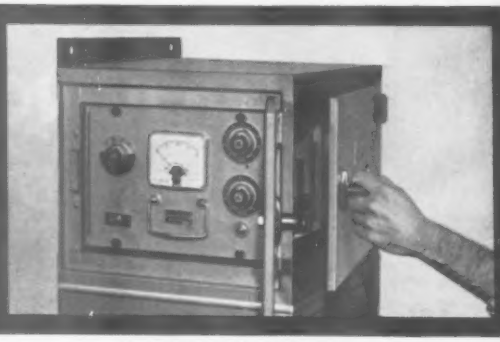

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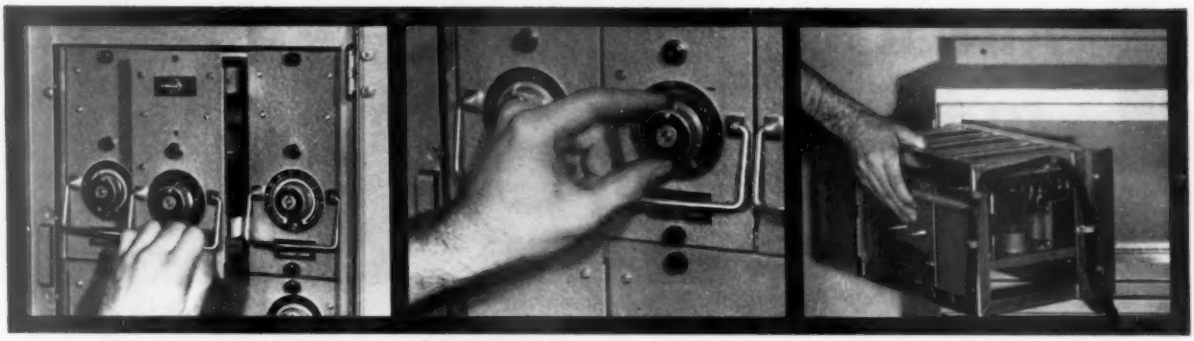

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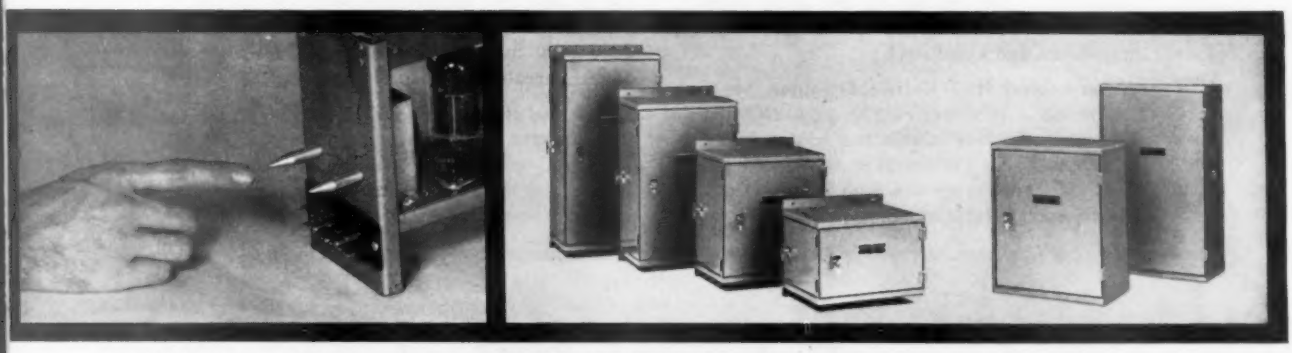

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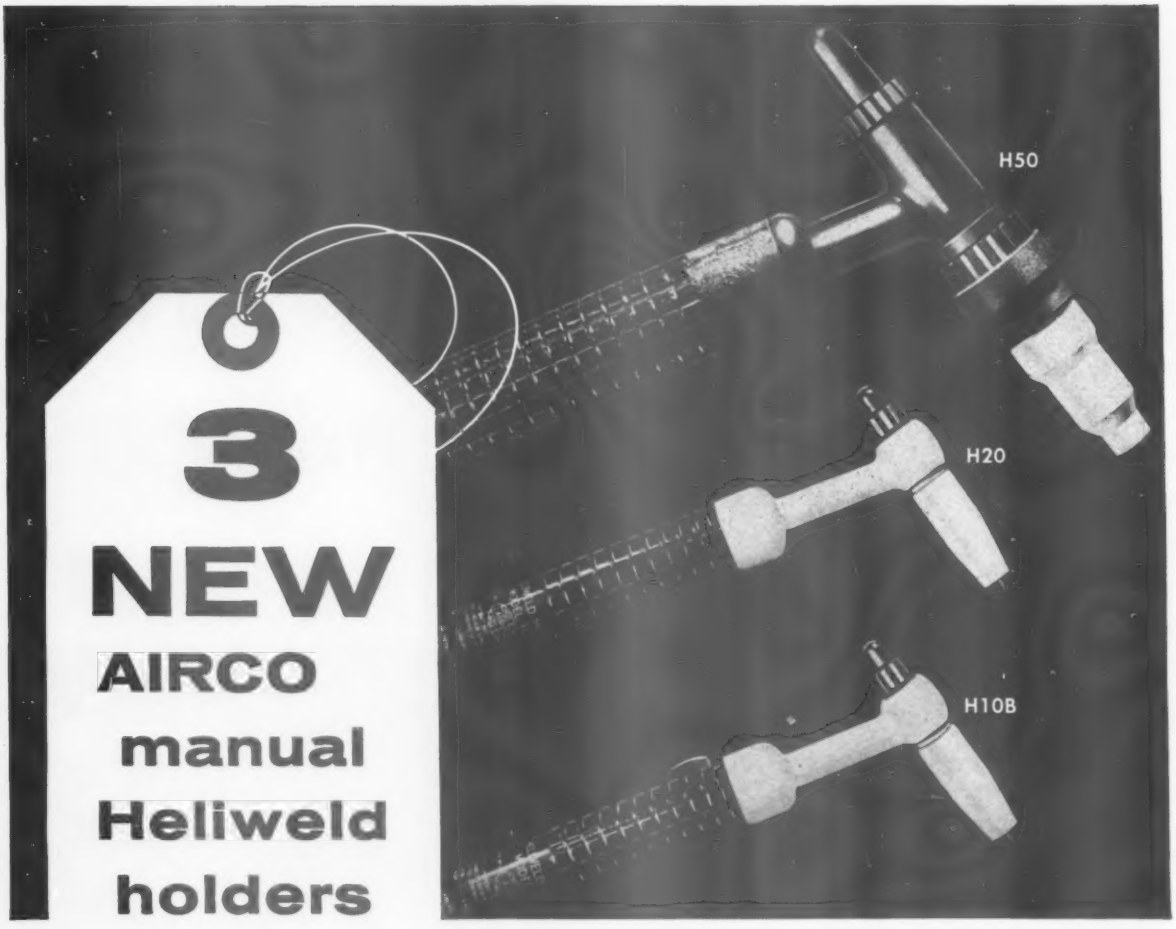

3 NEW AIRCO manual Heliweld holders

for greater flexibility in tungsten arc welding

Wider and higher current ranges of these three new Heliweld holders add a new measure of versatility in the welding of thin gauge sheet aluminum, stainless steel, copper base alloys, magnesium and killed steel.

Water-cooled H50 Heliweld holder has a continuous duty rating of 500 amps DC and 350 amps AC. New nozzle and holder design provides efficient gas coverage at reduced gas flow . . . costs less to operate. Stub loss only 1¼". Parts interchangeable with M50 machine holder.

Water-cooled H20 Heliweld holder has a continuous duty rating of 200 amps, AC or DC, yet is only 7¾ inches long; weighs 4 ounces. Compactness of the welding head makes the H20 ideal for welding in tight corners. Parts interchangeable with the H10.

H10A and H10B Heliweld holders, both air-cooled, have continuous duty ratings of 100 amps, AC or DC. The H10B holder is the *only* unit on the market that has a thumb-operated gas valve on the handle for greater gas savings.

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BETWEEN PASSES

satellite

More details on the earth satellite launching rocket were disclosed last month at a meeting of the American Rocket Society. First-stage propellent tanks of the 72-ft, 11-ton vehicle are of welded aluminum. Second-stage tanks are stainless steel. Remainder of the second-stage skin is magnesium thorium. The nose cone is molded asbestos phenolic material, with a titanium tip. Liquid oxygen is one of the fuel elements for the Vanguard vehicle. Details on construction and operation of the rocket were given by two Martin Co. engineers.

costly illness

Absenteeism costs employees in private industry a whopping $800,000,000 in lost wages (13% of their annual income), according to the Research Council for Economic Security. Prolonged illness and absence from the job results in lost production time of nearly $2,000,000,000. The Council recently completed a five-year study of non-occupational illness, which further revealed that prolonged illness struck employees at the rate of 39 to 1,000 on the payroll. When personal medical expenses are added to the above figures, the cost of absenteeism reaches into the billions. Some other facts unearthed by the study: absence is greater among women workers than among men, greater among production workers than among salaried, and it rises markedly with age.

no shortage

A spokesman for the steel industry recently told highway department engineers that there would be no shortage of facilities needed to turn out the huge quantities of steel for the national road building program. L. Abbett Post, executive vice president of the American Institute of Steel Construction, wrote highway officials that although the industry will be called upon to fabricate 22,500,000 tons of structural steel for the road program alone over the next 13 years, the tonnage is well within reach. Most of this steel will be used for bridges.

slap-happy

If you haven't already done so, read the editorial by T. B. Jefferson on page 29 of this issue. Members of this staff aren't the only ones who feel that way. We talked with a great number of persons at the welding show in Philadelphia who are also "convention slap-happy." Several manufacturers, in fact, added another complaint . . . the high cost of shipping their exhibits from one end of the country to another. Many of our readers present in Philadelphia asked why *Welding Engineer* doesn't say something about the poor scheduling of conventions. They need not have. The editorial was being set in type at the time we were in the City of Brotherly Love. And *WE* has complained about this more than once before . . . right on this page.

more rumbles

While in Philadelphia, *WE* also heard complaints from many persons who want to know, "Why Buffalo again?" This is in reference to the site for the 1959 welding show. *WE* asked that question a while back on this page. So far no answer. And we can think of several cities large enough to hold the show and convention . . . cities that have never before played host to the show.

safety award for WE

Welding Engineer has been voted the National Safety Council's Public Interest Award for 1956. The non-competitive award is made annually for exceptional service to safety and recognizes *WE*'s role in prompting safe uses of welding, cutting and grinding tools.

we underestimated

Our predictions for a $¾ billion welding market in 1956 fell short of reality. The Research Dept. of *Welding Engineer* has come up with its report of the sales volume for last year, and the good news appears on pages 31, 32 and 33 of this issue. The welding market has grown tremendously in recent years, and the industry is rapidly approaching the $1 billion mark . . . so rapidly, in fact, that 1957 should see that mark surpassed.

hardfaced for Arctic

Hardfacing finds still another application: Army engineers investigating the possibilities of excavating frozen ground in the Arctic have been making tests with an auger that has high-grade alloy cutting teeth hardfaced with tungsten carbide. Construction equipment specialists at the Engineer Research and Development Laboratories are experimenting with a new truck mounted earth auger developed by H. B. Williams Mfg. Co., Dallas.

help shortage

The industry is still suffering from a shortage of help, as evidenced by "salesman wanted" signs prominently displayed in several booths at the welding show. *Welding Engineer* still gets leads on some of these openings, so if you want to work for a welding-equipment manufacturer, get in touch with the editor of this page at *WE*.

a day for everyone

What did you do to celebrate April 28? Or didn't you know it was National Mother-In-Law Day?

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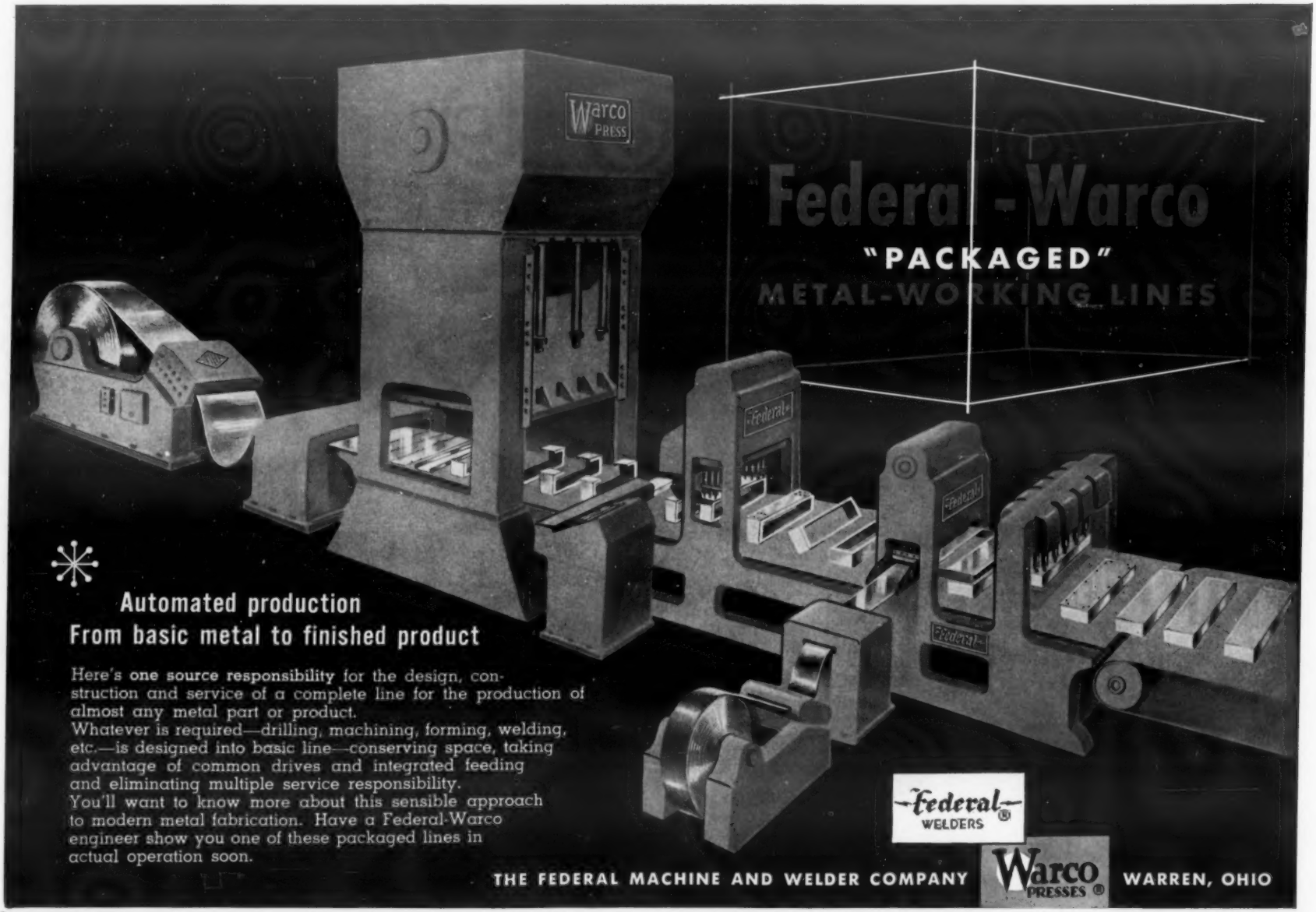
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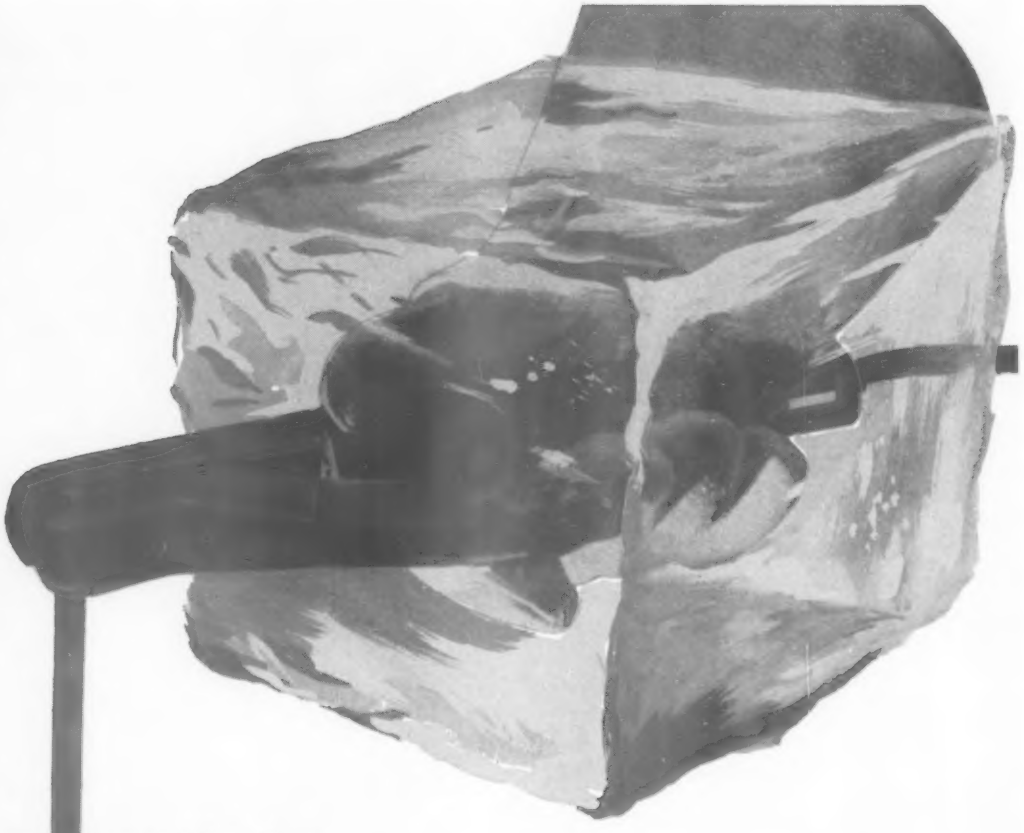

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Welding Engineer

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Better timing . . . please!

WE'RE CONVENTION-happy—or, better still, "convention *slap*-happy." Why? Because those who plan conventions and trade shows for an industry don't devote much thought to their plans. If they did, they would coordinate activities with other organizations within the industry.

In a recent three-week period, we attended conventions in Los Angeles, Minneapolis and Philadelphia (one each week). A few days from now, we'll be going to Washington for another. All of these meetings are important to the welding industry and a great number of people would like to attend. *But they cannot afford either the time or the expense.*

We were there because WELDING ENGINEER, in serving the welding industry, feels that it is important to have editorial representation at all major meetings of the industry. We are apparently the only publication in the welding field that accepts this responsibility to industry.

Trade shows are a necessity, but one may legitimately question their number and frequency. One may also wonder why show managers, in striving for bigger and better expositions, *ring-in* products and exhibitors that have little, if any, connection with the industry in question. This practice may be profitable for show management, but it is not in the best interests of the industry.

CONVENTIONS are frequently tied-in with trade shows, but many are held without the aid of this "package deal." We understand that many conventions are cooked up by association or society secretaries merely to give members an opportunity to "get away from home" periodically. This is undoubtedly true in some organizations, but fortunately for the welding industry, most of our meetings are designed to pass on pertinent, up-to-the-minute information.

Even this helpful knowledge loses its value, however, when you count the welding conventions and meetings held in the course of a year. If a person were to attend them all (as does the editorial staff of WELDING ENGINEER) he would spend three months away from shop or desk in a year's time. This leaves him very little time to put into effect the information gathered at the meetings.

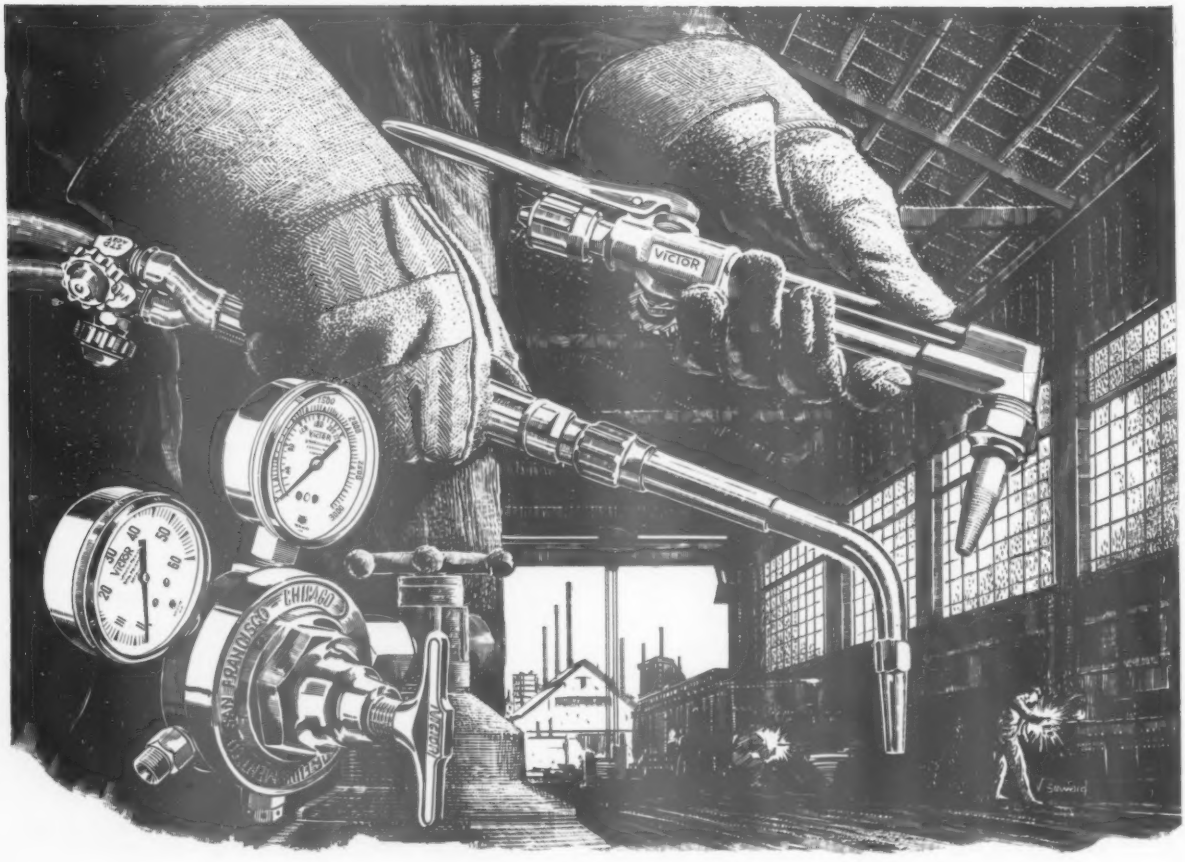
ILLUSTRATING the minimal coordination between meeting planners is the fact that many exhibitors at the Philadelphia welding show had to air-freight their exhibits from Los Angeles to allow time for setting up in the East. This needless expense could have been avoided by an ounce of foresight. But, of course, planners aren't concerned with expense. This is the exhibitor's problem.

Two years hence, the welding industry's two major meetings are scheduled for San Francisco and Buffalo with only a weekend intervening. We have heard that planners reply to queries concerning this tight schedule by stating, "you should be thankful that your organization is farsighted enough to plan its meetings so far ahead."

Is it farsighted to expect an individual to show in San Francisco one week, then break his neck getting to Buffalo over the weekend for another exhibit? Anyone displaying products at both shows will *need* the weekend to set up his Buffalo exhibit!

It's high time that organization representatives put aside petty fears and jealousies and get together. Many groups could easily combine meetings and shows and schedule them simultaneously or consecutively in the same city. Time would be conserved, attendance would be improved, and the industry would be far happier.

Until they realize that *time* is one of industry's most important commodities, however, show planners will remain on their thoughtless course of action . . . killing the geese that lay those golden eggs.



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WE Research Department reports:

1956 sales total $929 million and 1957 outlook offers a billion dollar opportunity

By T. B. Jefferson

BEATING its previous record by a country mile, the welding industry in 1956 pushed sales of equipment and accessories to an all-time high of $929,869,413. According to WELDING ENGINEER's Research Dept., this total is almost $227 million greater than 1955 gross sales.

Though welding has scarcely scratched the surface of its potential market, it is obviously attaining mature stature. With but a little additional effort, the industry might have surpassed the billion-dollar mark in 1956—a goal that seemed distant as late as 1955.

An Important Role

All phases of the industry demonstrated remarkable growth during 1956, a fact which may be attributed in part to price changes during the year. But a healthy upswing in sales of gas, arc and resistance welding equipment and accessories—as well as in welding gases—actually contributed over $200 million during the year.

At a time when the gross national product has passed the $440-billion level . . . when national debt is close to $275 billion . . . and when the government contemplates expenditures of $1 billion every five days during fiscal 1957-58, welding's $929 million in sales seems insignificant.

Such figures alone are misleading, however, for *WE*'s Research Dept. points out that welding played an important role in the production of goods valued at $150 billion. Viewed in this light, welding's contribution to the gross national product was sizeable—and *vital!*

Effects of industrial strife on the welding industry during 1956 can never be assessed. In retrospect, however, it seems that a billion-dollar year was in the making had it not been for the steel and copper strikes, an aluminum shortage, and short supplies of many other materials which curtailed welding uses.

Effects of the 1956 steel strike were reflected in a 2,000,000-ton drop in ingot production and a resultant 4,500,000-ton reduction in sheets, shapes and plates. Shortage of heavy plates and shapes hit most structural fabricators and resulted in production cut-backs of

How the Welding Dollar was divided

FOR:	Total Industry	Arc Welding	Gas Welding	Resistance Welding
Arc Welding	27.0%			
Machines		21.8%		
Electrodes		57.4		
Accessories		9.2		
Argon & Helium		11.6		
Gas Welding	65.1%			
Oxygen			41.8%	
Acetylene			47.4	
Apparatus			6.9	
Accessories & Rods			3.9	
Resistance Welding	7.9%			
Machines				77.6%
Controls				9.4
Electrodes				13.0
	100%	100%	100%	100%

Figures for the Facts

How the Dollars Went in the Welding Industry

	1952	1953	1954	1955	1956
Gas Welding and Cutting Industry	$374,913,810	$418,042,250	$365,640,643	$472,464,469	$604,993,811
Arc-Welding Industry	170,022,502	157,589,284	135,933,996	179,982,555	250,912,182
Resistance-Welding Industry	41,794,453	38,153,601	37,321,291	50,312,245	73,963,420
Welding Industry Totals	$586,830,765	$613,785,135	$538,895,930	$702,464,469	$929,869,413

How Your Welding Dollar Was Spent

Arc-Welding Industry	1952	1953	1954	1955	1956
Machines	$ 41,604,065	$ 36,773,165	$ 33,043,167	$ 42,984,162	$ 54,589,837
Arc Electrodes	111,930,454	104,831,898	87,881,398	119,063,630	144,066,992
Accessories	16,487,983	15,984,221	15,009,431	17,934,761	22,987,623
Argon and Helium					29,267,730
Gas-Welding Industry					
Oxygen	119,276,095	139,187,436	123,949,000	162,932,174	252,766,844
Acetylene	205,328,703	229,842,689	198,369,000	261,419,570	286,874,321
Gas Totals	324,604,798	369,030,152	322,318,000	424,351,744	539,641,165
Apparatus	32,968,656	29,986,440	26,830,794	30,681,422	41,966,043
Welding Rod and Accessories	17,340,356	19,024,658	16,491,849	17,136,503	23,386,603
Resistance-Welding Industry					
Apparatus, Controls and Electrodes	$ 41,794,453	$ 38,153,601	$ 37,321,291	$ 50,312,245	$ 73,963,420

large-diameter line pipes, oil industry storage tanks, pressure vessels and other heavy fabrications.

In some areas, a particularly acute shortage of steel forced fabricators to reduce working personnel. Many of these employers, and others, were also laboring under the effects of a wire shortage that seriously limited production of a wide range of welding electrodes and welding wire.

Trouble With Copper

Strikes in the copper industry caused their share of welding industry misfortunes. The copper shortage had a spiraling effect on market price of this important commodity, and for a time it appeared that raw copper would exceed the 50-cents-a-pound mark.

Before reaching this level, however, the climb was broken and prices on some copper-alloyed items have actually been reduced. This phenomena has occurred several times in the bronze welding rod market in recent months.

One result of the copper shortage was the irreparable loss to copper producers of a part of the welding market. In changing from copper to aluminum windings to maintain production, some welding machine manufacturers encountered a satisfactory situation—efficiency-wise, and from the standpoint of machine weight reductions.

Gases for Welding

Annual production in cubic feet

	Argon	Acetylene	Oxygen
1952	153,403,000	5,963,801,000	22,814,299,000
1953	175,321,000	6,525,000,000	27,573,600,000
1954	186,197,000	6,197,000,000	22,073,600,000
1955	216,314,000	8,204,317,000	29,091,873,000
1956	325,187,000	9,254,000,000	31,602,000,000

Aluminum's lightness also contributed heavily to the widespread acceptance of aluminum welding cable. The welding public purchased over 1,500,000 lineal feet of aluminum cable during the year.

Expanded uses for aluminum in the wire and cable fields—as well as a more widespread use of Mig (metal inert-gas) welding—soon put aluminum producers in the unhappy position of having a greater demand for wire products than their facilities could handle. As 1956 drew to a close, the normal waiting period for delivery of aluminum welding wire was 60 days—a situation which further curtailed welding uses.

Gases Lead the Field

As in 1955, major sales gains during the 1956 period were effected in the gas welding field, which received 60% of all the money spent in the welding industry. Production of oxygen and acetylene increased approximately 10% over the preceding period.

This rise in production, coupled with a price adjustment, put dollar volume for these gases over $539,000,000 in 1956. Complementing this figure was a $10-million jump in gas welding and cutting apparatus sales which, during 1956, totaled nearly $42,000,000.

Over $18,000,000 was spent on accessories and supplies used in gas welding, and an additional $5,000,000 was received for welding rods and alloys. Grand total for the gas welding field, then was $604,993,811.

With sales of approximately 637,500,000 lb of welding electrodes, manufacturers received $144,000,000 to rank second in welding industry sales totals for 1956 Poundage sold was the result of the fourth-highest production schedule in the history of electrode manufacture.

Production figures for 1956 were exceeded only by the wartime years of 1942, '43 and '44, when a record electrode rate was established to meet demands of the shipbuilding industry. And 1956 figures might even have drawn closer to those set in the war years had the steel industry been able to furnish all the wire that

Electrode Production

	Pounds
1941	386,886,131
1942	745,893,457
1943	1,086,784,300
1944	847,937,972
1945	541,829,046
1946	340,029,320
1947	360,098,430
1948	436,359,255
1949	329,596,600
1950	422,287,900
1951	549,327,781
1952	573,376,722
1953	547,614,604
1954	431,263,875
1955	571,284,926
1956	637,576,092

Welding Wire Production

Electrodes and Wires	Pounds
1941	425,574,744
1942	803,755,822
1943	1,133,876,000
1944	890,243,721
1945	589,371,842
1946	370,632,958
1947	388,121,600
1948	467,986,321
1949	352,668,360
1950	450,848,053
1951	587,780,940
1952	607,496,832
1953	580,223,145
1954	460,942,721
1955	604,387,921
1956	677,058,075

was needed by electrode manufacturers.

A gas that has become vitally important to the welding industry—argon—showed a record-breaking production increase in 1956 of 150% over the quantity reached in 1955. A total of 325,187,000 cu ft of argon was produced, and sold for over $29,000,000.

Argon Now Included

For the first time, WELDING ENGINEER's Research Dept. has included dollar volume of argon sales in its annual welding statistics. But even without this $29-million addition, the arc welding field still came within a hairbreadth of the quarter-billion mark.

Of the record $221,000,000 received for arc welding machines, accessories and equipment, we have already seen that electrodes captured a $144 million market. Machines themselves brought in $54,000,000—an approximate 25% gain over 1955—and arc welding accessories sold for a record total of $22,987,623.

The whopping increase in machine sales is accounted for by increased production and by a continuing program of changeovers from manual to automatic equipment. This program has led to increased sales of constant-potential and rectifier-type welding machines.

Further development in Mig and Tig processes, which allows these processes to be used for cutting as well as welding, has contributed to increased arc welding sales.

Steel Production in the U.S. 1941-1956

Ingots	Tons
1941	82,927,557
1942	86,029,921
1943	88,836,366
1944	89,641,575
1945	79,701,624
1946	66,602,706
1947	84,783,981
1948	88,533,729
1949	77,868,353
1950	96,713,276
1951	105,134,553
1952	93,156,375
1953	111,609,716
1954	88,311,652
1955	117,382,024
1956	115,216,149

Plates, Shapes & Sheets	Tons
1941	23,342,334
1942	27,488,389
1943	23,219,605
1944	23,498,712
1945	24,681,737
1946	21,396,280
1947	28,492,386
1948	29,215,509
1949	21,670,929
1950	26,983,427
1951	30,826,444
1952	25,498,190
1953	26,889,093
1954	28,002,100
1955	36,097,565
1956	31,430,662

And the cost of employing these processes has been lowered with the up-and-coming use of carbon dioxide as a shielding gas.

Resistance Welding Records

Not to be outdone by other welding processes, the resistance welding industry set some records of its own in 1956, with sales of nearly $74 million for machines, electrodes and controls. Of the total amount, $57½ million was spent for machines.

The resistance welding industry benefitted greatly in 1956 from two all-important factors:

1—A better selling and merchandising program by manufacturers of resistance welding equipment.

2—A better understanding by manufacturers, users and potential users of resistance welding's capabilities.

As a result of these significant changes—ones that should flourish in coming years—the resistance welding industry has now doubled the sales volume set in 1951.

1957 is IT!

In view of record-shattering 1956, it is apparent that 1957 should be the welding industry's first billion-dollar year. As if to bolster this prediction, first-quarter sales have averaged about 12% ahead of those for the comparable period in 1956.

There have been cut-backs in some industries—notably home construction and automotive—but demands for welding are still running high. Actually, even with reduced production, welding uses in automobiles manufacture are scaling upward. Tooling and production changes for 1958 models will necessitate additional welding and welding equipment in this field.

The highway building program soon to be undertaken should open a broad market for welding equipment. If the welding industry will do a good job in selling welding to architects, engineers and designers associated with this project, the program alone could add 10% to welding industry sales for each of the next 10 years!

Valuable untapped markets for the welding industry are the structural welding and the machine tool fields. Some headway is being made in both industries, but there is no time like the present to hit both even harder.

Material shortages continue to hurt the welding industry, and the loss of argon production through strikes has virtually halted work in some areas. Most argon users, however, are bridging this temporary gap with CO_2 and welding sales continue to soar.

With continuing improvements in products and promotion, welding sales in 1957 should surpass the billion-dollar mark. General business outlook for the year ahead is *good;* for those who will do an honest job of selling welding, the outlook is even better.

* * *

***Credits**—The Research Department of* WELDING ENGINEER *wishes to thank the following organizations for their assistance in the preparation of data on these pages: U. S. Department of Commerce; American Iron & Steel Institute; Resistance Welder Manufacturers Ass'n; Resistance Welding Alloy Ass'n., and manufacturers in the welding industry.*

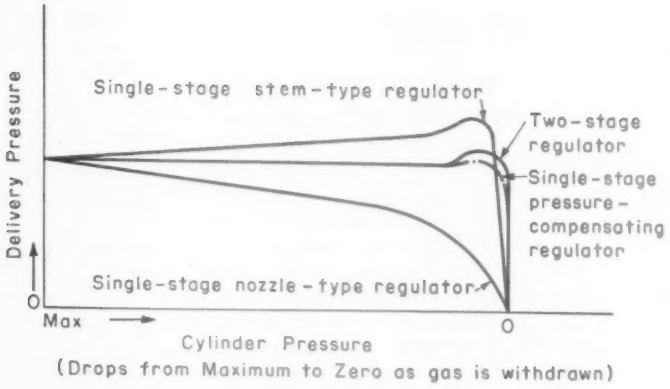


FIG. 1: Delivery pressure characteristics of four regulator types, as they react to decreasing cylinder pressure.

Part II (conclusion):

How to select proper regulators

By A. F. Chouinard, *Manager*
Research and Development Dept.
National Cylinder Gas Co.

In concluding this two-part series, the author finds the pressure-compensating, nozzle-type regulator most suited for use with any gas type but CO_2. Here's why . . .

NOZZLE SIZE and seating materials should be carefully considered in regulator selection. Nozzles are usually stainless steel on high-pressure units, brass on acetylene types.

High-pressure regulators can use small nozzle sizes to pass large volumes of gas because of high inlet pressure. This increases the ratio between nozzle and diaphragm, resulting in a more sensitive operating characteristic.

Seating materials are generally nylon for high-pressure regulators, synthetic rubber for acetylene types. Nylon offers flame resistance, stiffness and some resilience. It does not cold-flow under continuous pressure; therefore, the seat need not be changed as it often must with a material that does.

Selected for Pressure

Nylon is not suitable for acetylene regulators because too great a force would be needed to seat the relatively large nozzle. Seat materials, hardness and type are selected for pressure involved.

The adjusting spring also affects sensitivity. A longer spring gives greater sensitivity. Regulators may have compound adjusting springs: a long, light spring picks up low-pressure loads, and a short, heavy spring the high-pressure loads.

Spring force—*i. e.*, the difference in pressures exerted by adjusting and compensating springs—governs gas volume that regulators can pass.

Delivery pressure characteristics, which determine regulation efficiency and torch flame control, vary with regulator types. If inlet pressure is set at some chosen value and cylinder gas is withdrawn with no readjustment of the screw, delivery pressure may increase, decrease or remain constant, depending on regulator type.

Cuts Welding Speed

In a nozzle type, delivery pressure gradually decreases as cylinder pressure falls. To maintain the same flow rate for a given delivery pressure with a specific combination of hose length and tip size, the adjusting screw must be tightened gradually as pressure falls.

If no readjustments are made, decrease in delivery pressure (and decreased flow rate) might cause the torch to overheat, or change flame characteristics sufficiently to produce poor results and cut down welding speed.

Gradual decrease in delivery pressure is caused by a changing balance in forces acting to position the regulator seat. Four forces act on the seat of a nozzle regulator and tend to hold seat away from nozzle. They may be identified in the accompanying sketches.

Force (F_1) of adjusting spring (transmitted through diaphragm and yoke) is exerted downward on the seat. Force (F_2) of compensating spring is exerted upward.

Force (F_3) of delivery-gas pressure acting over effective area of the diaphragm (and transmitted through the yoke) is exerted upward, and force (F_4) of cylinder-gas pressure acting over effective nozzle area is exerted downward.

Thus, at any given cylinder pressure, F_1 plus F_4 equals F_2 plus F_3. To see how force balance on the seat varies, the following example is presented.

Initial Pressure

At an initial oxygen-cylinder pressure of 2,000 psi, force F_4 (assuming an effective nozzle area of 0.0155 sq. in.) would be 2,000 x 0.0155, or 31 lb. This force, in combination with the other three, would hold the seat a certain distance from the nozzle.

As cylinder pressure decreases, seat-nozzle distance would have to increase to maintain equal volumetric flow. As gas pressure falls, its density decreases; therefore, to get the same volume through the regulator, a larger opening between seat and nozzle is needed.

What happens as cylinder pressure falls? With a cylinder pressure of 100 psi, force F_4 would equal 100 x 0.0155 lb compared to 31 lb at a 2,000-psi cylinder pressure.

With other forces remaining substantially constant, upward forces would be greater than forces working downward on the seat, and would tend to decrease seat-nozzle distance; therefore, the regulator would be partially closed. Instead of seat-nozzle distance increasing to maintain equal flow rate, it would actually decrease, thereby reducing oxygen volume supplied to the welding torch.

Frequent Adjustments

As cylinder pressure decreases, the operator would have to tighten the adjusting screw occasionally to increase spring force and compensate for decreasing force (F_4) from falling cylinder pressure.

Periodic adjustments, with frequency depending on gas quantity being used, would result in a saw-tooth-shaped falling curve if plotted on a graph. This curve would approximate constant delivery pressure of all gas from a cylinder initially full.

In stem-type regulators, delivery pressure gradually increases as cylinder pressure decreases until the cylinder is nearly empty. Then it falls rapidly.

Again, as in a nozzle-type regulator, four forces act on the seat. Three forces act in the same direction as in nozzle regulators. The force from adjusting screw spring acts downward on the seat, that from compensating spring acts upward, and that from delivery gas pressure also acts upward.

But the force of cylinder gas pressure acts upward instead of downward in a stem-type regulator. As this force (F_4) falls with decreasing cylinder pressure, adjusting-spring force becomes relatively greater than the other three and pushes the seat open still further. Gas flow then increases, requiring periodic retraction of adjusting screw to maintain gas volume at its original value.

Flame Control

A plotted curve for a stem-type regulator would also be saw-tooth in shape, but would differ in slope from that of a nozzle-type regulator—it would be rising. But it, too, would approximate a constant-delivery pressure.

Far better regulation of pressure

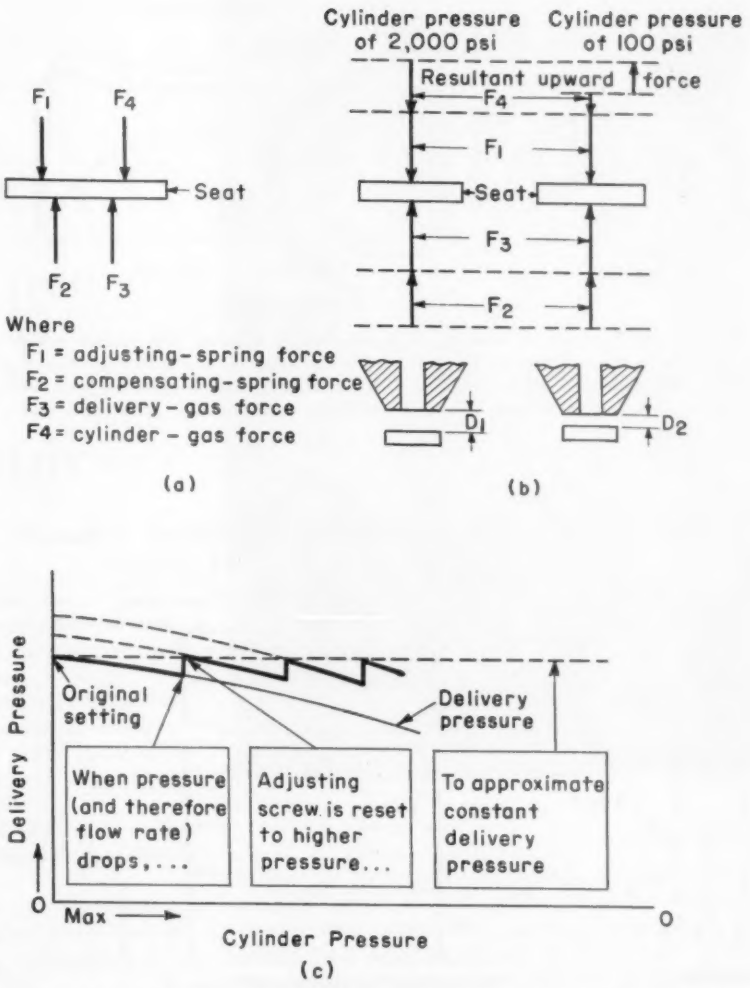


FIG. 2–Four forces act on the seat of a nozzle regulator to affect delivery pressure in a single-stage nozzle-type regulator. Changing balance in these forces cause gradual decrease in delivery pressure. (See text for an example which fully explains the action of these forces in both nozzle- and stem-type regulators and in the two-stage type.)

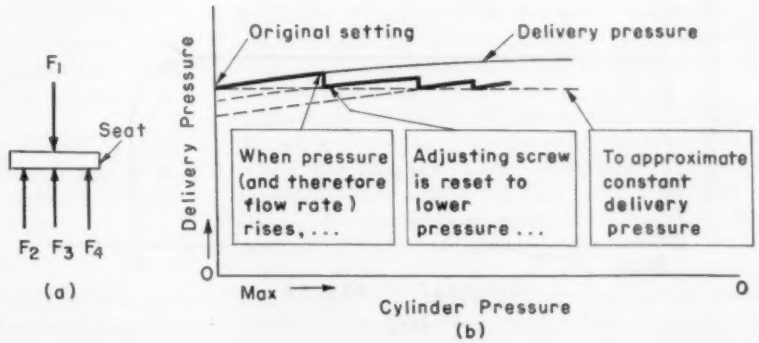


FIG. 3—Delivery characteristics of a single-stage stem-type regulator. Saw-tooth falling curves, which approximates constant delivery pressure, is caused by periodic operator adjustments in spring force to counteract upward gas flow.

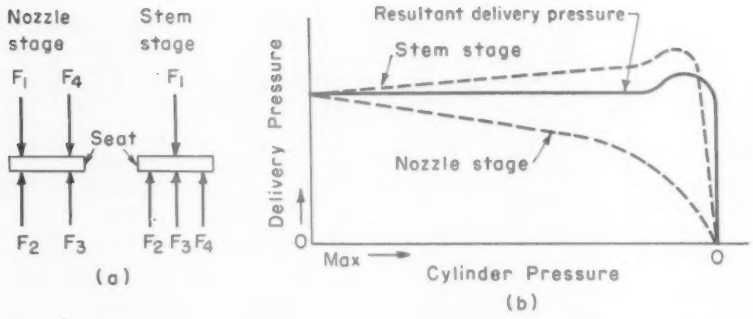


FIG. 4—Delivery characteristics of a two-stage regulator. The author notes that "far better regulation of gas pressure and volume, and better control of the welding flame" can be obtained with this type. Falling and rising pressure curves in nozzle and stem stages, respectively, balance each other and give precise gas flow.

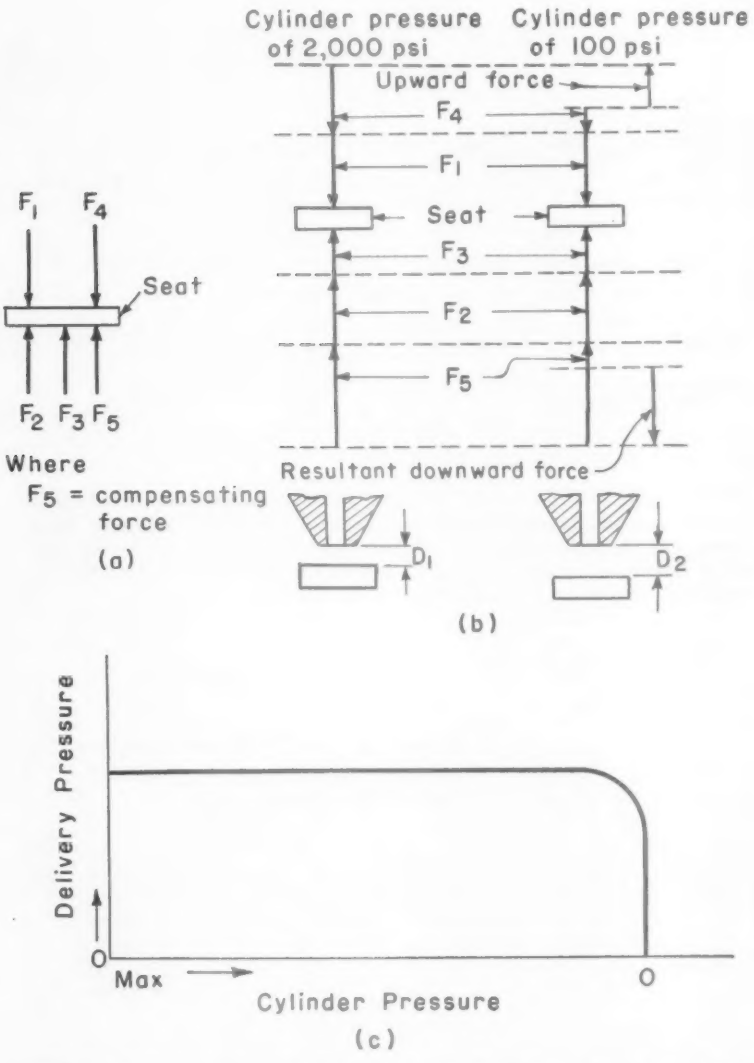


FIG. 5—Pressure-compensating chamber in a single-stage nozzle-type regulator gives gas delivery characteristics normally found only in two-stage type. Fifth force is gas pressure acting on pressure pin.

and volume, as well as better control of welding flame, can be obtained by using a two-stage regulator.

The first (nozzle-type) stage tends to give a falling pressure curve, the second (stem-type) stage gives a rising pressure curve. The two balance each other, providing a precise, constant gas flow. Operator time is saved, and oxidized or carburized welds (from non-neutral welding flames caused by fluctuating gas volumes) are avoided.

A study of forces acting on the seat of a single-stage nozzle-type regulator with a pressure-compensating chamber shows how this regulator type gives users constant pressure and flow rate that distinguish the two-stage type.

As in nozzle types, four forces act on the seat. Two, F_1 and F_4, act downward; F_2 and F_3 act upward.

Falling Pressure

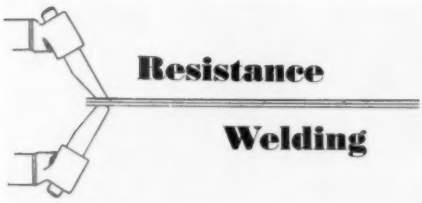
But the pressure-compensating chamber introduces a fifth force, F_5. It results from cylinder-gas pressure acting on the pressure pin. Force F_5, exerted upward, is greater than force F_4 because effective area over the pin is greater than effective area of nozzle size on seat. As cylinder pressure (F_4) drops, force F_5 falls too, but not so rapidly.

At a 2,000-psi initial cylinder pressure, force F_5 is about 60 lb as determined experimentally. When cylinder pressure falls from 2,000 to 100 psi, force F_5 decreases from 60 lb to about 6 lb. At the same time, force F_4 decreases from 31 to about 1½ lb.

Total downward force decreases roughly 29½ lb, and total upward force about 54 in. Resultant downward force moves the seat downward, increases seat-nozzle distance, and so maintains the same volumetric flow rate.

The pressure-compensating, nozzle-type regulator can be specified for use with any type of gas except the liquefied type, which has constant vapor pressure. This regulator type also does not offer any particular advantages with carbon dioxide because of the refrigerating effect of this gas as it expands.

However, with other gases, its pressure-compensating feature maintains constant pressure and volumetric flow rate. In welding it maintains correct flame characteristics without sacrificing high flow rates of single-stage regulation.



Resistance Welding

Resistance types with a valuable industrial history

By Jack Fairlie

THOUGH it is, in fact, a spot welder, the resistance seam welder has earned its distinctive title because of the manner in which it can make overlapping spot welds to create gas- and liquid-tight seams

This process, which has proved particularly valuable to the aircraft and automotive industries, employs machine equipment and controls not unlike those used in standard spot welding. Electrodes, however, constitute one very important point of differentiation.

Circular wheels are the electrodes used for seam welding. They not only clamp workpieces, but feed them into, or past, the throat of the machine.

Setting up for seam welding requires adherence to close tolerances. Plates, sheets or shaped material to be joined must be overlapped or butted, and tacked before seam welding to reduce warpage.

Plates and sheets are commonly joined by a simple lap joint weld. Amount of overlap should be sufficient to prevent weld metal from being ejected at the point where stock is joined. This fit-up method is done for *spot* seam welds.

If a *mash* seam weld is desired (on plates up to 0.062-in. in thickness), overlap is increased to approximate thickness of pieces being joined and welding speed is decreased. Current is continuous and clamping pressure is greater than that needed for ordinary seam welds.

The resultant weld is extremely strong. Sheets in the lapped area will lie on the same plane, and the line of weld will be raised. This *ridge*, however, is usually no more than 25% of plate thickness.

Butting of parts for seam welding is done on those occasions when a pipe or tubing fabricator desires the use of this process in preference to flash-butt or some arc welding process.

Current Losses

When overlapping spot welds are being made to produce a tight seam, some current is lost as it flows into adjacent welds. Because of this *shunting* effect, slightly more current is required for seam welding than for spot welding.

FLASH-butt welding in progress.

Current interrupters—preferably electronic—are a necessity for seam welding: they allow the operator to control what might otherwise be a troublesome heat affect. Each weld is allowed to cool under pressure through use of an interrupter, and this device also helps control the serious problem of warpage.

Warpage begins when excess heat flows into the sheet adjacent to the weld area and, of course, it is abetted by the heavy clamping pressure so necessary for good seam welds. Current interrupters help reduce its severity, and water coolant, ejected from hoses onto the workpiece near the point of electrode contact, further halt this detrimental action.

A seam welder's circular electrodes are gear-, knurl- or friction roll-driven. Both wheels may be powered, or one may serve as an idler. Mandrels may be used in conjunction with a standard wheel in applications with hard-to-reach areas.

Electrodes are beveled on one or both sides, and the contact face may be either flat or it may have a slight crown. The latter is a common wheel type. Diameters of these electrodes usually fall in a range from 7 to 10 in., but for special uses wheels are available in sizes as small as 2 in. or as large as 18 or 24 in.

Width of the electrode face is dependent upon thickness of material being welded. Heavy-gage plates demand broader face widths because the electrode must withstand heavier clamping pressures and higher welding currents. The smallest practical face width is approximately ⅛ in.

—*Courtesy Northrop Aircraft, Inc.*

GIANT seam welder at left, built by Sciaky Bros., Inc., is longitudinal type. Workpiece (component for jet plane) is fed into throat of machine by circular electrodes. Close-up above shows circular seam welder joining flange to cone assembly. Tubes carry water coolant which helps prevent warping of workpiece.

Three general machine types for seam welding are the *circular*, *longitudinal* and *universal* welders.

Electrodes on the circular machine feed workpieces *across* the throat of the machine as welding progresses. Workpieces are fed *into* the throat of the longitudinal type.

The universal seam welder is a combination of the other types, and can be quickly modified to perform its operation in either manner.

Because of structural strength needed to give adequate clamping pressure to workpieces, seam welders are normally stationary. Some portable models are in use, however, which make *roller spot welds* (*see* WELDING ENGINEER, *April, 1957, p. 62*).

Demanding less clamping pressure because welds do not overlap, these units are actually spot welders operating on a seam welding principle.

Flash-Butt Welding Process

Easily the most dramatic of resistance welding process, the flash-butt method marks the completion of every weld with a shower of sparks as workpieces are forged together under sudden pressure.

Flash-butt and upset-butt welding processes are often confused by many—and with good reason. Both use very similar equipment, but they differ in method of heating workpieces to welding temperature.

As one of the oldest forms of resistance welding, the upset-butt method naturally employs what might be termed a *normal* method of attaining welding heat—*i.e.*, by butting workpieces under pressure and allowing metal resistance to current flow to raise heat sufficiently on joint faces. Amount of molten metal upset from joint faces is an aid in determining necessary current.

Workpieces are not butted tightly when flash-butt welded, but instead are held in light contact, or are separated by a minute gap. Current arcs between workpieces and, in so doing, brings joint faces to welding temperature.

While arcing progresses, workpieces must be steadily moved toward each other to maintain the arc. When welding heat is reached, heavy pressure is applied, current is turned off, and parts are welded.

Care in Positioning

Flash-butt welding has now surpassed upset-butt in popularity because it requires less power and uses less power; it is faster and can be applied to dissimilar metals, and it gives a comparatively smaller upset.

Bars, pipe and tubing, forgings and sheet metal are all being joined successfully by flash-butt welding. But regardless of metal type, shape or thickness, workpieces must be carefully positioned to insure a sound joint.

Two workpieces that are out of alignment will create arcing over only a portion of their abutting edges. Some part of the joint face, then, will not attain welding heat and will cause worpieces to slide apart when forging pressure is applied.

Helping to keep workpieces aligned are the clamping electrodes. These components may also provide upset pressure when welding heat is reached, thereby exerting a pressure on workpieces two or three times that of upset pressure—or even more.

Necessary clamping pressure can be reduced, however, through use of *backups* that perform the work of impelling workpieces together for upset.

Our apologies . . . *to Acro Welder Mfg. Co., 1719 W. St. Paul Ave., Milwaukee. In a listing of member firms of the Resistance Welder Manufacturers Ass'n. in our March issue (p. 46), Acro was erroneously labeled "Acme."*

11,250 see welding show

Attendance records set by AWS in Philadelphia

LEFT holding the gavel, new AWS President C. P. Sander seems pleased with the idea, and so does outgoing President J. J. Chyle, who made presentation.

By Jack Fairlie

IN THE HABIT of breaking production and sales records while on the job for their respective firms *(see page 31)*, American Welding Society members went to Philadelphia on April 8 and toppled prevailing registration records at the 38th annual meeting and 5th annual welding show.

More than 1,830 persons registered for the meeting, which this year was termed the Adams National Meeting to honor founder Comfort Avery Adams. Non-member guests from all areas of the U. S. and from India, Spain, Japan, Sweden, South America, Canada and 9 other nations helped swell welding show registration to 11,250—up 44% from the 1956 show in Buffalo.

FOUNDER and first president of AWS, Comfort Adams, visited *Welding Engineer's* booth at welding show to chat with Editor and Publisher T. B. Jefferson. Annual AWS meeting was renamed this year to honor Dr. Adams.

The newly-finished Hotel Sheraton served as official AWS headquarters for activities lasting until noon on Friday, April 12. A normally heavy schedule of technical papers was delivered here, beginning early on Monday afternoon.

The American Institute of Electrical Engineers co-sponsored several technical sessions. An AIEE committee on electric welding also participated in discussions.

Sander Named President

First business on the meeting agenda was attended to Monday morning when Society officers for the 1957-58 term were announced, and awards were presented for service to welding and to the Society.

As announced in the April issue of WELDING ENGINEER, Clarence P. Sander was elected AWS president for the year beginning June 1. Sander, general superintendent of the Vernon plant *(Los Angeles)*, Consolidated Western Steel div., U. S. Steel Corp., was introduced to members at the opening business session by outgoing President John J. Chyle, A. O. Smith Corp., Milwaukee.

Serving as first vice president will be Gustav O. Hoglund, head of the welding section at Alcoa's process development laboratory in New Kensington, Pa. Charles I. MacGuffie, marketing manager of General Electric Co.'s welding dept., York, Pa., will be second vice president. Treasurer is Harry E. Rockefeller, manager of electric welding at Linde Co., New York.

(One of two problems unresolved in later business sessions concerned still another officer, Secretary J. G. Magrath, who announced that he would not be a candidate for re-election. No successor had been appointed at this writing—nor had further action been taken on a second "hot potato": a possible hike in membership dues.)

Award Recipients

The Samuel Wylie Miller Memorial Award went this year to Fred L. Plummer, director of engineering at Hammond Iron Works, Warren, Pa. Plummer was cited for "outstanding contributions in the application of welding to storage tanks and to the advancement of en-

TEN thousand words were better than pictures at Handy & Harman booth, and most of them were devoted to value and uses of silver-brazing alloys.

gineering technology in shop and field fabrication of welded structures."

De Witt C. Smith, chief metallurgist for Harnischfeger Corp., Milwaukee, delivered the Adams Lecture on Monday morning. His topic was "Evolution of high-tensile weld metal with low-hydrogen electrodes."

The 1957 Lincoln Gold Medal went to Jay Bland, project engineer in the engineering and research dept. of Standard Oil Co. (Ind.), Whiting. A. N. Kugler, chief welding engineer for Air Reduction Sales Co., New York, received the National Meritorious Service Award for "outstanding service rendered the AWS for many years."

A former president of AWS, O. B. J. Fraser, was presented with an honorary Society membership in recognition of "exceptional accomplishments, specifically in joining nickel and nickel alloys." Fraser is assistant manager of the development and research div., International Nickel Co., New York. The awards program concluded with the presentation of 18 regional meritorious service awards.

A Gift to Adams

High point of the meeting's social calendar was the president's reception and banquet on Monday evening. At the banquet, Dr. Adams, who is now 88, was presented with a portrait of himself. Making the award to the Society's first president was H. W. Pierce, himself a former president of AWS.

On Tuesday at noon, while many members remained at the Sheraton to hear technical papers on resistance welding, weldability and research, and welding on structures, others trooped across town to Convention Hall to witness the opening of the welding show.

President Sander flame-cut a "ribbon" of steel links to officially open the exhibition which, in its first 10 hours on Tuesday, was visited by 5,200 persons. Over 100 firms manufacturing welding equipment and supplies displayed approximately 2,500 products during the course of the 3-day show. Demonstrations of new products and of products currently in use were conducted in many booths.

Interesting Applications

General Electric Co. made many sample welds in the vertical-up and overhead positions with its carbon dioxide-shielded "Fillerarc" process. The addition of a reactor to its normal d-c generator power source made possible this unique out-of-position welding.

Linde Co.'s "Unionarc" and the "Dual Shield" process developed by National Cylinder Gas Co. *(see page 41)* attracted wide interest among show registrants. Both are semiautomatic processes designed mainly for mild steel applications, and both use CO_2 as a shielding gas.

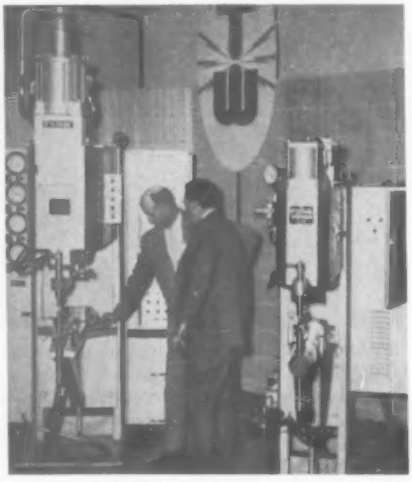
Other centers of interest were Stoody Co.'s booth, where L & B Welding Equipment, Inc., demonstrated its new automatic gas welding unit— the "Optiflame Model D"—and the booth sponsored by Tec Torch Co., where visitors watched welding applications with that firm's new Tig (tungsten inert-gas) spot welding gun.

After a 12-hour display on Wednesday and 8 hours on Thursday, the welding show closed its doors. It will reopen again in St. Louis when the AWS convenes there for its annual meeting in the Spring of 1958.

The three simultaneous sessions which closed the week-long meeting on Friday morning were devoted to gas-shielded welding, pressure vessels, and hardfacing, brazing and soldering.

Throughout the week, many social activities were scheduled for wives who accompanied their husbands to Philadelphia. Tours of plants operated by U. S. Steel Corp. and by Westinghouse Electric Corp. were also arranged for members and guests.

LEFT: Pretty miss proved to this audience that spot welding with G-E's "Fillerarc" unit was something she could do easily and well.



RIGHT: ". . . and it comes out here," says this representative of Taylor-Winfield Corp. to visitor interested in large spot welding unit. Resistance welding machines were popular attraction at welding show.

WELDOR using "Dual Shield" process is said to enjoy greater arc visibility because flux is contained inside welding wire and spatter is thereby reduced. National Cylinder Gas Co., developer of the new process for mild steel applications, claims that 99% of weld metal is deposited in joints. Initial cost of all process components, including weldor training expense, is reportedly less than $2,300.

NCG introduces "Dual Shield" for mild steel

By a Staff Member

"DUAL SHIELD"—another new arc welding development for mild steel applications, was introduced by National Cylinder Gas Co. on April 9 at the AWS welding show in Philadelphia.

NCG's public exhibition of this semiautomatic process followed close on the heels of a Linde Co. release on the latter's "Unionarc" process—also semiautomatic and also designed for mild steel.

In planning, development and testing stages for the past 10 years, "Dual Shield" employs a flux-cored welding wire and a carbon dioxide shielding gas. The chemical flux includes an ionizer to stabilize the arc, a deoxidizer to permit the welding of mill-run steel without scale removal or other cleaning, and a slag-forming agent.

The arc obtained with this semiautomatic gun is reportedly 1,000 F hotter than an average 9,000 F arc. Penetration is said to be 40% greater than that given by a stick electrode.

In demonstrating and describing the new process, NCG has stressed a "visible arc" characteristic achieved through use of the flux-cored electrode. With granular flux out of sight, and with reduced spatter because of an ionized arc, the weldor can follow closely the point of contact between welding wire and base metal.

"Dual Shield" Electrode Data

Diam. (in.)	Spool Wght. (lb)	Length (ft)
1/16	25	2,800
3/32	25	1,200
1/8	25	700
5/32	50	1,000
5/32	100	2,000
3/16	50	625
3/16	100	1,250

Equipment Package

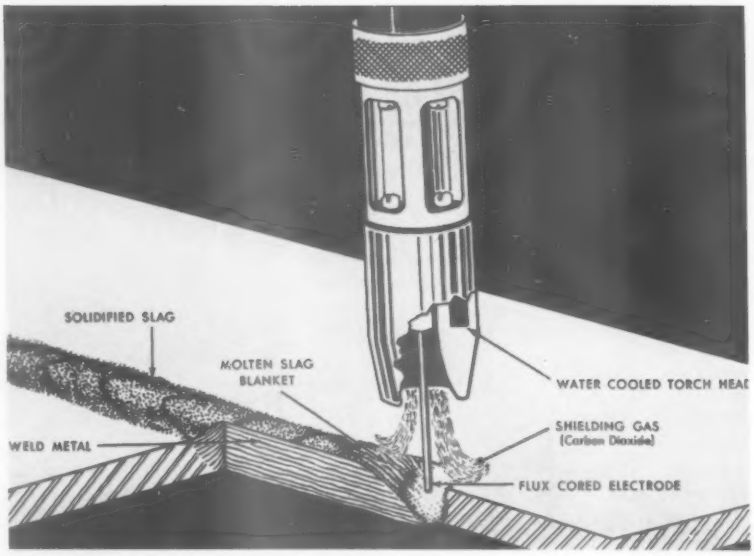
"Dual Shield" electrodes are available in 1/16, 3/32, 1/8, 5/32 and 3/16-in. sizes. Equipment includes a power source (NCG used a constant-voltage rectifier machine in its Philadelphia exhibition); a combined welding control and wire-drive unit, and a 1½-lb welding gun.

After making preliminary adjustments for wire-feed rate, CO_2 flow and voltage output, the weldor allows ½-in. of welding wire to protrude from the gun nozzle. With wire held close to the workpiece, the weldor pulls the trigger on his gun and simultaneously touches electrode to

workpiece. Wire feed starts automatically when the arc is struck.

Welds reportedly can be made at a rate of more than 20 in. per minute on ¼-in. fillet welds, and in excess of 30 ipm on butt welds in ¼-in. plate. NCG states that welds made with 3/32-in. "Dual Shield" electrodes have "a strength equivalent to welds made with ordinary ¼-in. stick electrodes."

Weld metal deposition rate for the semiautomatic process, using a 3/32-in. electrode, is said to be 14½ lb per hour. This figure compares to approximately 3½ lb per hour deposited by the manual stick electrode method.



CUT-AWAY sketch shows "Dual Shield" gun in operation. Use of carbon dioxide shielding gas allows relatively low-cost operation. On the basis of time and cost savings claimed for new process, NCG expects an immediate market for it among industrial weldors switching from manual to semiautomatic operations.

Field Tests

Through data collected in field tests throughout the country, NCG has "conservatively estimated" that the "Dual Shield" process can increase production 33% over that obtained with other established semiautomatic methods. Some tests were successfully employed on T-1 and rim-type steel.

One firm which field-tested the new process manufactures die shoes in more than 30 sizes from 0.04 x 0.04 in. to 14 x 14 in. The welding of hold-down flanges on each shoe constitutes an important production operation.

Previously welded manually with E6020 electrodes, the flanges are beveled 45 deg on both sides *(90-deg included angle)* and have a lip of ⅛ in. or less. Six passes had to be made with stick electrodes, and workpieces had to be turned frequently during welding.

NCG notes that weldors performing this same operation with "Dual Shield" make only two passes on each side of flanges to fill the beveled joint. The second pass is made immediately after the first, and slag is not removed from the first bead.

Manual welding procedures required 46 minutes to complete one die shoe size. This same shoe is now being welded by the field-testing firm in 6 minutes with "Dual Shield" equipment. A further savings on this same job was effected in the use of an operator previously untrained in any form of welding.

Additional field tests of "Dual Shield" were made by a manufacturer of gas cylinders and transport trucks in Texas; a Cleveland firm which welds components for derricks and clamshell rigs, and by several other manufacturers.

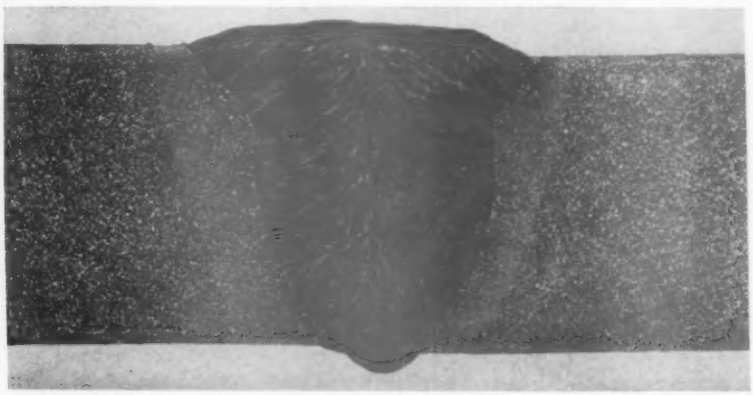
Time Reduction

A Florida oil tank fabricator reportedly found that circumferential welds on some tanks, which required 35 minutes with stick electrodes, are now being made in less than half that time with the new process. Included in the revised welding schedule is set-up time.

The flux-cored welding wire for the "Dual Shield" process is manufactured at NCG's Cicero, Ill., plant. Starting as a coiled band of steel which is run through specially designed rollers in a tube mill and converted to U-shaped strip, the wire receives an even distribution of the flux additive before being closed.

This cored wire is 3/16 in. in diameter. Smaller sizes are produced by feeding the 3/16-in. coils through other rollers that reduce the electrode to desired size. *(A table with this article gives data on welding wire currently being produced.)*

Prior to electrode production in quantity, "Dual Shield" welds were given stress and strain tests, and micrographic color close-up pictures were taken at a speed of 3,000 frames a second to permit intensive studies.



CROSS-section of butt weld in ⅝-in. mild steel made by new process shows deep penetration, smooth bell-shaped bead contour, and uniform grain structure. Physical property tests show a 74,000-psi tensile strength; yield strength of 61,000 psi, and 26.5% elongation in 2 in.

How to cut welding costs in the field

1—PIPELINE application of twin arc welder.

THE NEED for welding equipment suitable for field applications has increased tremendously in recent years. Responsible for this need is the ever-mounting rate of pipeline and other steel construction.

While it is possible to use electric motor driven welding generators in the field where utility power is available at a reasonable cost, the bulk of field welding is done with internal combustion engine driven machines. These may consist of rectifier or m-g welders powered by an engine driven generator or individual engine driven welders.

A large majority of these machines have been single unit welders (an engine driving one welding generator) even where groups of these single machines are used at one spot. An example: on the stringer and hot pass operations of a pipeline job or in the construction of a steel storage tank.

It is obvious that under these conditions, the primary advantage of flexibility of the single units is minimized or lost completely. Thus there have been attempts by some large users of welding equipment to build units which directly drive more than one generator from a single engine.

These units were highly successful in proving the advantages of multiple units in both operating and maintenance costs. However, they did not gain popularity because they were not available in factory engineered, standard design packages.

To remedy this, engine manufacturers have designed and built a line of multiple welding generators suitable for all types of field welding.

Dual Welder Unit

One of the first units developed contains a twin arc-welder (photo 1). This unit consists of two separate 300-amp generators driven by a single diesel engine. It provides a compact, self-contained, dual unit with each generator operating completely independently of the other despite the common drive.

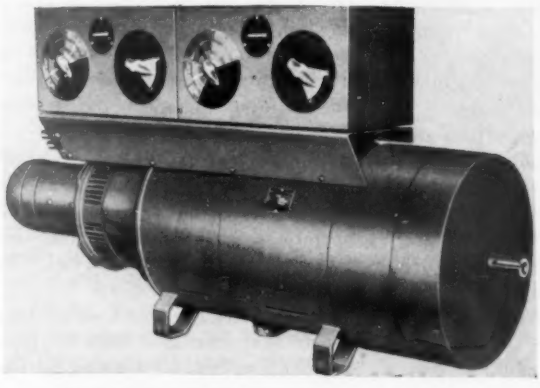
Since it was felt that there could be objection to a belt drive because of possible slippage affecting arc characteristics, a newly developed twin generator was used in building the package. It consists essentially of two welding generators and a single (3 kw) common exciter mounted within one frame.

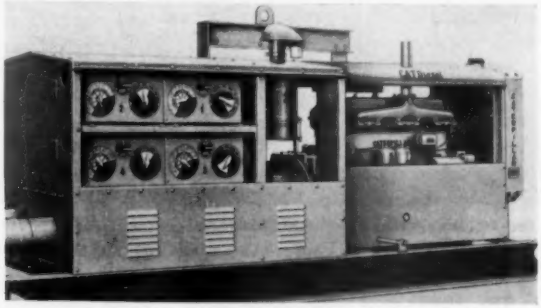
Each generator has separate controls and may be operated at any setting within its range without affecting the arc of the other generator. Adequate horsepower of the driving diesel engine assures that even operation at maximum settings will not affect engine speed to any degree where it would be felt in the arc.

Also, because of the relatively cheap fuel and economical operation of the diesel, a throttling device was purposely omitted. This means the arc is hot immediately upon contact, and no time is wasted waiting for the engine to come up to speed.

The common drive and exciter makes it easy to parallel generators for greater capacities than can be delivered by one machine. There is no problem of adjusting governors

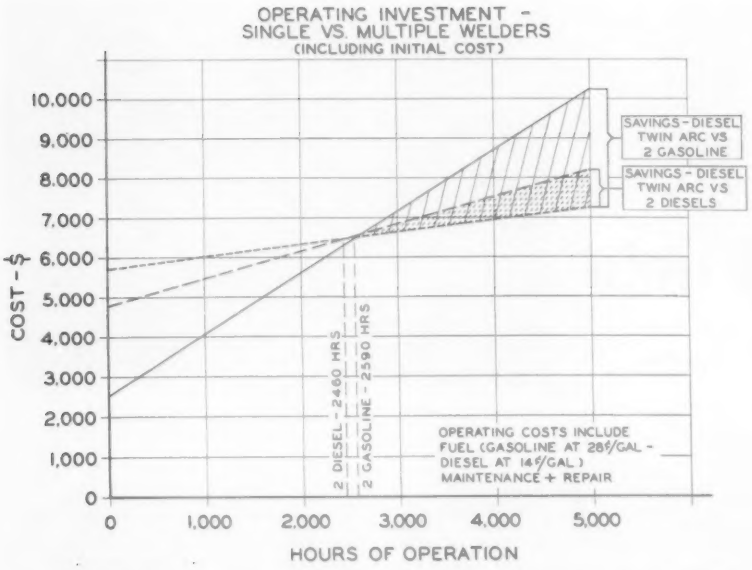
. . . with engine driven welders





2—LEFT: Twin generator consists of two welding generators and single 3-kw common exciter mounted within one frame.

3—ABOVE: Natural successor to twin arc welder is this quad arc unit.



4—DESPITE lower initial cost, two gasoline driven units (represented by solid line) have consumed nearly $3,000 more at end of 5,000 operating hours than tractor-mounted twin arc welding package. Two separate diesel units, which also have lower initial cost, consumed almost $1,000 more at 5,000-hour mark.

on separate machines so each will take its share of the load. To parallel, you merely connect output terminals of both machines. This provides a unit capable of producing 600 amp of welding current.

Four Welders

A natural sequel to the above machine was the development of a quad arc-welder. As the name implies, this machine provides four separately controlled generators driven from one diesel engine (photo 3). As in the twin, the quad uses the newly developed generators. In this case, two twin generators are driven through a lubricated chain compound, again eliminating any possibility of belt drive slippage.

With the use of many welding generators at one location, it is sometimes necessary to have on hand a supply of compressed air to operate tools such as buffers, grinders, chippers, etc. For this reason, a quad arc-welder with the additional attachment of an air compressor was developed.

The compressor will deliver 80 to 100 cfm of compressed air at 100 psi, and is thus capable of operating any small air tool commonly used on a field welding job. Since the air compressor is also driven by the diesel engine, the package provides a completely self-contained field welding tool.

Foremost among the many savings realized through the use of multiple welders is the very obvious one in engine maintenance. Since one heavy duty diesel engine replaces from two to five gasoline or small diesel engines, the number of overhauls is automatically cut in direct proportion. In addition, labor and materials for routine maintenance is also cut in direct proportion to the number of engines.

Important Fuel Savings

Although reductions in fuel costs are often overlooked, they represent one of the largest single savings. For example, a gasoline engine driven welder doing the same work as a diesel will burn about twice as much fuel.

Gasoline costs approximately twice as much as diesel fuel, making the overall fuel cost roughly four times greater. This is exclusive of any gasoline lost by theft—quite common when machinery is left unattended at night.

Multiple diesel units also provide a fuel saving over single unit diesels by increasing the duty cycle on the engine itself because of the work load imposed by the multiple driven machines. While the savings here are not as great as compared to gasoline machines, field experience has indicated that fuel costs can be cut from 25% to 50% with the use of multiple unit welders.

The chart accompanying this article illustrates graphically the savings in engine maintenance and fuel costs realized when using a diesel twin arc-welder. Although the initial investment for a diesel twin arc-welder is slightly over twice that for two single gasoline units, the difference in operating costs will pay for the greater investment in only 2,590 hours of operation.

Shipping Expenses Cut

In addition to savings shown by the chart, multiple units are generally lighter in weight and more compact than an equivalent amount of single unit welders. One quad arc-welder weighs some 2,500 lb less than four single diesels. This allows easier handling and less expense in shipping equipment from one job site to another.

While the chart illustrates the savings resulting only from a diesel twin-arc generator as against two single machines, a similar presentation can be made for a quad arc-welder vs. four single machines. In this case, the savings will be even greater because of a proportionally lower initial investment.

As the idea of multiple packages gains more favor than that currently enjoyed, there will no doubt be requests for additional packages—some possibly using as many as 12 welding generators. The construction of such packages should present little difficulty now that the basic idea has been formulated and job proved.

The foregoing has been primarily concerned with engine driven welders, which can be found on almost any field welding job. But a more specialized type of power unit is finding greater application in pipeline welding. This is the tractor mounted welder.

Modern pipeline welding on all but the smallest diameter pipe is usually carried out in three separate operations. These are commonly referred to as the stringer bead, hot pass, and finish operations.

In the stringer bead operation, two to four men tack weld the pipe sections together, all working on the

same joint at the same time and welding from one half to one quarter of the pipe circumference (depending, of course, on the number of men used in the operation). As soon as the stringer bead is completed, another group of weldors runs a second bead, called the hot pass, around the pipe. Here again several men work on a single joint at the same time.

A common method of hot pass welding uses two crews of two weldors each with one man welding half of the pipe circumference on every other joint.

The finish crew consists of weldors who run the finish or cap weld—each man completing the full pass by himself. These men also leap frog each other as welds are completed. Hence single welding machines are used by the finish crew, while it is necessary to concentrate from two to four machines in one spot for the stringer and hot pass operations.

Evolution Traced

Several arrangements of welding equipment are used for stringer and hot pass operations. Until recently, each arrangement used a number of individual engine driven welders. The units differed only in the type of vehicle used to carry the machines.

Photo 5 illustrates an arrangement where three individual engine driven machines are mounted on a track wagon and towed by a tractor. Added to the welding equipment and tow tractor investments is the cost of the track wagon.

The next step in transition to the tractor-welder is depicted in photo 6.

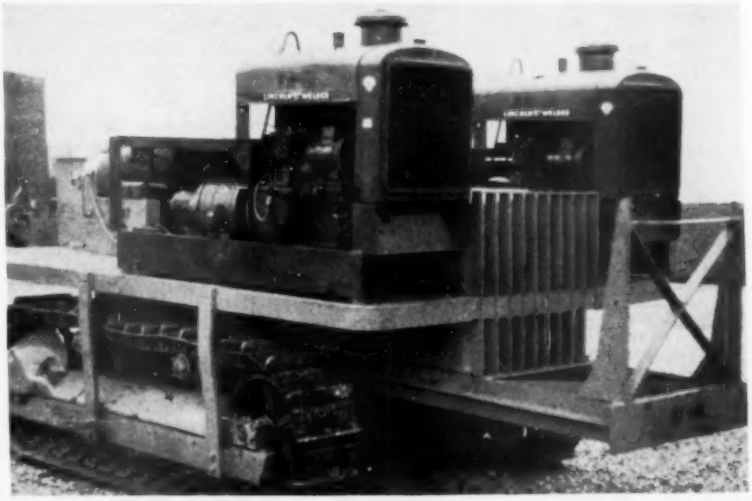
By mounting welding machines on a frame built around a tractor, the track wagon was eliminated. The field welding unit became a self-contained, self-propelled package. The operator's visibility was seriously impaired, however, by the machinery surrounding him. In addition, he was subjected to the heat, noise and vibration of individual engines in the welding machines.

Some contractors found they could improve operator's visibility by removing fuel tanks on individual machines and feeding fuel from the tractor tank, cutting down the hoods and moving the control boxes to a point within the reach of the operator.

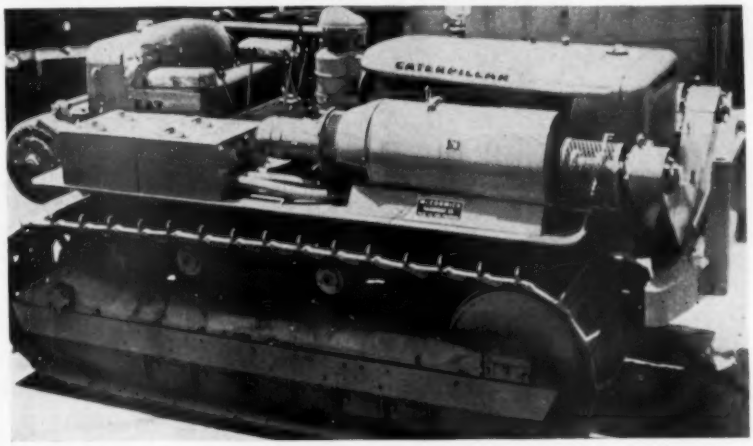
Photos 7 and 8 show the latest developments in tractor welders. Both of these machines consist of two twin

. . . with tractor mounted welders

5—THREE individual generators mounted on track wagon and towed by tractor was one of first steps in evolution of tractor-mounted welder.



6—WELDING machines mounted on frame built around tractor was next step.



7—PRESENT development has controls mounted on right rear fender. Generators are mounted forward on fenders.

300-amp generators driven off the front of its tractor engine through a lubricated chain compound. Live power is available at all times so the tractor can be moved, or the rear winch operated, at the same time the welders are in use.

The unit shown in photo 7 uses a short shaft coupling with the generators mounted forward on the fenders. With this arrangement, control boxes are mounted in a horizontal position

on the right rear fender within easy reach of the operator.

By mounting welding generators on the tractor and driving them with the tractor engine, definite savings result in both initial investment and operational costs. Using the tractor engine to drive the welder eliminates the cost of four individual gasoline or diesel engines. The cost of the drive itself is balanced by the cost of a track wagon or supporting frame used in the other arrangements.

The operational cost savings fall into these categories:

(1) Savings in maintenance and repair costs.
(2) Fuel cost savings, and
(3) Labor savings.

With one heavy duty diesel engine in the tractor welder package eliminating four smaller engines, both routine and major maintenance and repair costs will be cut considerably. Parts inventory is also reduced.

Welding generator load imposed on the tractor engine, being well within the capabilities of the engine, will have little effect upon its life. Thus, the maintenance and repair savings will be about in direct proportion to the number of engines eliminated.

8—SIMILAR unit to that pictured in 7, but controls are mounted directly in front of operator.

Field performance of these units has been checked carefully. Results proved highly satisfactory, showing fuel saving of 75 to 80% (volume-wise) over an equivalent welding arrangement using four gasoline engine driven welders and a tow tractor. This is equivalent to an 85% to 90% dollar savings in fuel costs. Similarly, the tractor-welder showed an approximate 50% saving in fuel costs over a welding arrangement using four individual diesel driven machines.

Locating welder controls within reach of the tractor operator (as in the tractor-welder package) eliminates the need for an extra weldor's helper.

With the wide variation in fuel and labor costs it is difficult to estimate total annual operational savings. On one job in Canada, however, with the following specific costs, the savings for a 1,250 hour season were estimated at almost $6,000. The costs:

Gasoline 33.6¢ per Imperial gallon; diesel fuel 19.4¢ per Imp. gallon; weldor's helper $1.50 per hr. This represents savings over and above initial investment and maintenance savings.

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FOR ALL HEAT-DEPENDENT OPERATIONS

looks like a crayon... marks like a crayon... tells temperatures like a precision instrument!

Available in these Temperatures (F.)

113	375	1000
125	388	1050
138	400	1100
150	413	1150
163	425	1200
175	438	1250
188	450	1300
200	463	1350
213	475	1400
225	488	1450
238	500	1500
250	550	1550
263	600	1600
275	650	1650
288	700	1700
300	750	1750
313	800	1800
325	850	1850
338	900	1900
350	950	1950
363		2000

Sixty-three different compositions enable you to determine and control working temperatures from 113° to 2000° F.

TEMPILSTIK° marks on workpiece "say when" by melting at stated temperatures — plus or minus 1%.

ALSO AVAILABLE IN LIQUID AND PELLET FORM . . . WRITE "WELDING SALES" DEPT. FOR SAMPLE TEMPIL° PELLETS . . . STATE TEMPERATURES OF INTEREST—PLEASE!

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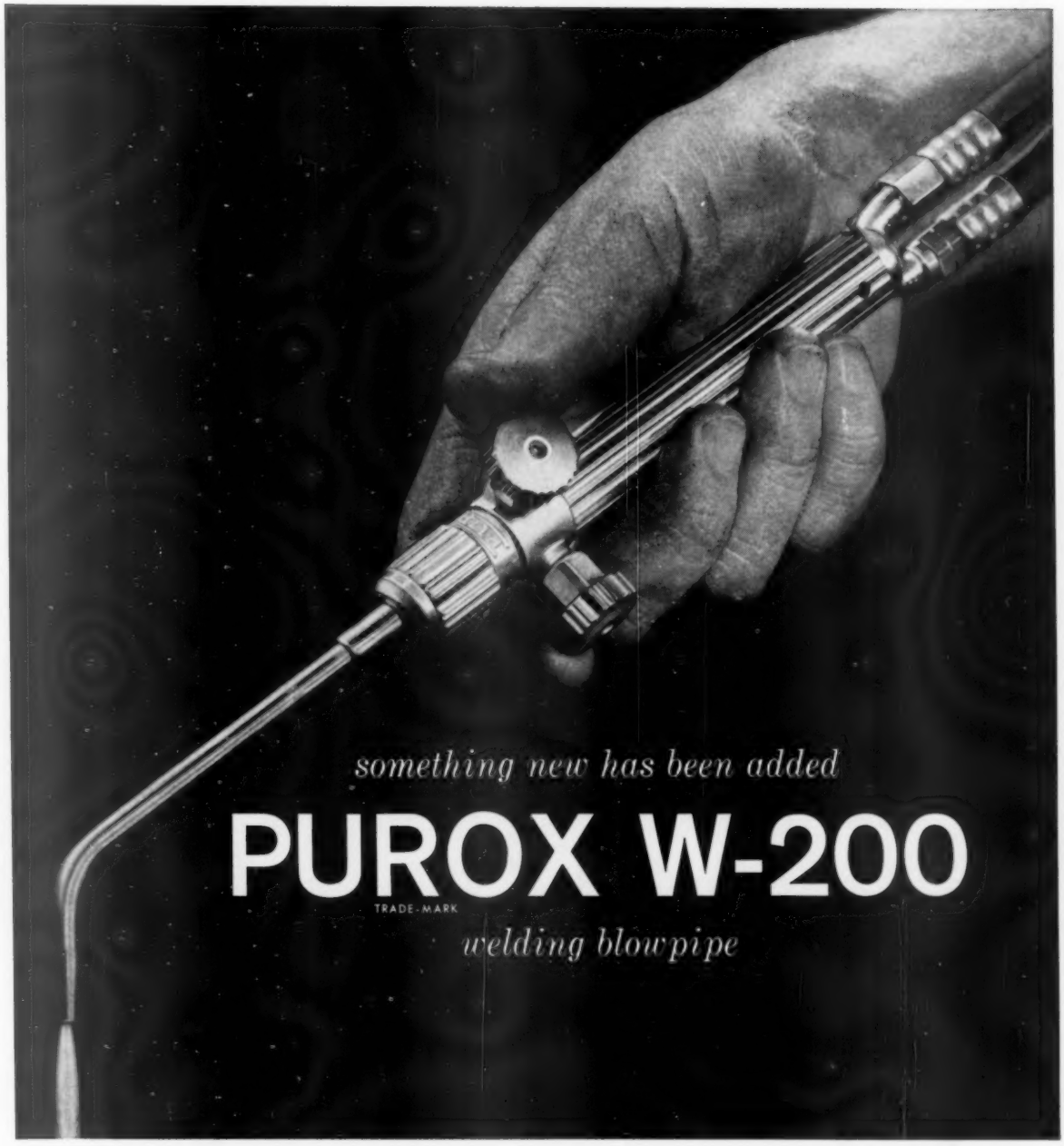

A flick of the wrist slips this eight-ounce blowpipe into corners, around jigs and fixtures or into any other hard-to-reach spot with ease. Small and handy, the PUROX W-200 Welding Blowpipe combines operating comfort with results that bring all types of light welding work up to the most modern standards.

Everything about this blowpipe has been designed to eliminate excess motion and to help cut down operator fatigue. Forward valves, for example, permit instant flame adjustment with the same hand used to hold the blowpipe. Snap-in heads with "O" rings connect simply and seal gas-tight without a wrench. They can be rotated on the blowpipe handle without shutting off the flame. Heads in nine sizes give a complete welding range from 32 ga. to ⅜ in. thick.

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Division of Union Carbide and Carbon Corporation.
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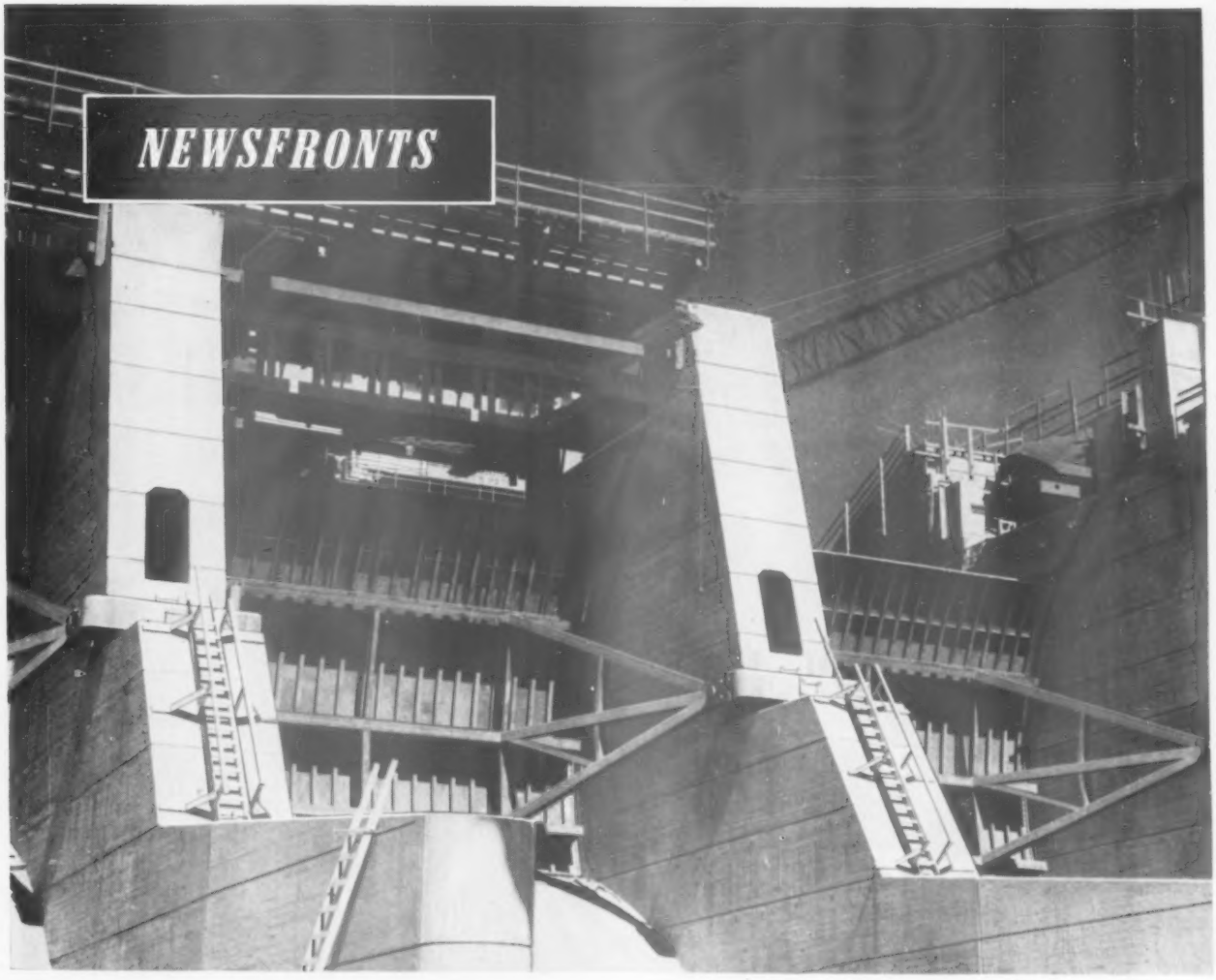


A. O. Smith electrodes help spin spiderweb of steel

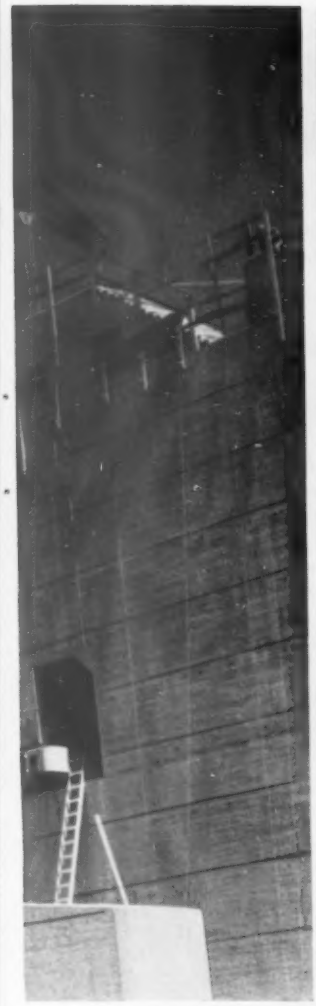
To make over 30 miles of welds on tainter gates for important new dams, Omaha Steel Works relies on A. O. Smith to supply electrodes with the precise characteristics to meet the most exacting demands.

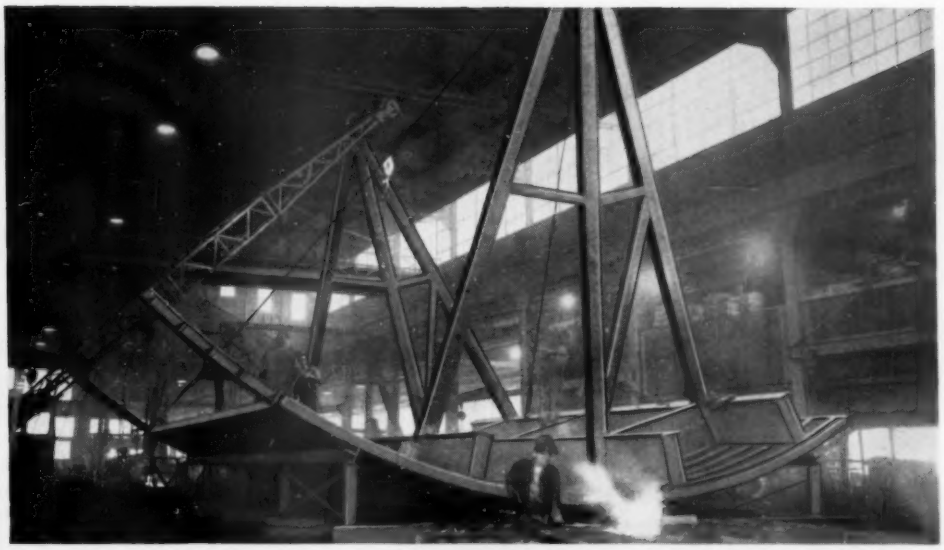
OMAHA Steel Works specializes in large, non-standard steel fabrications. In this case, their work involves producing 63 tainter gates (approximately ½ mile of welds per gate) and arms, pin anchorages and end abutments for the Fort Randall, Gavins Point and Garrison Dams in the Dakotas. All welds must be exceptionally dependable and most welds must have unusual strength to stand up under widely varying temperatures.

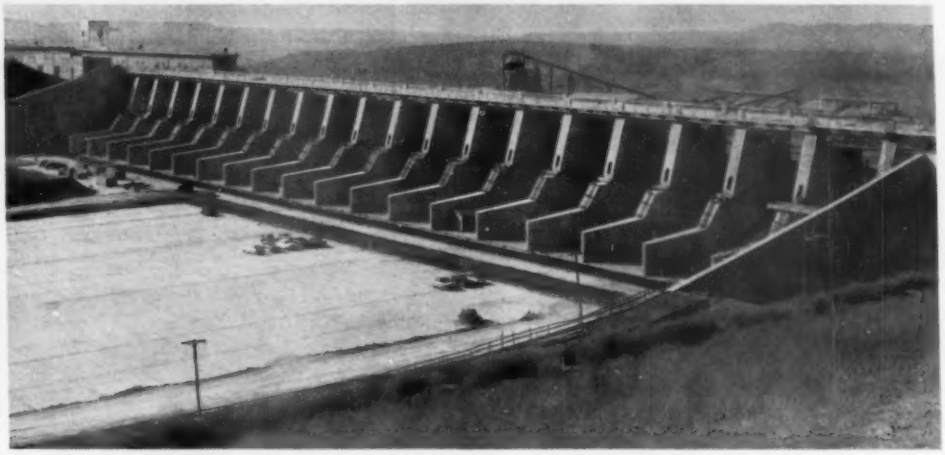
The basic electrodes used are A. O. Smith SW-65's (E-6016 low hydrogen) . . . SW-15's (E-6013 mild steel) . . . and SW-14's (E-6011 mild steel).

Omaha Steel Works' experience proves these electrodes provide the best combination of desired characteristics — speed, ease of use and weld strength. No wonder over 90% of this company's electrodes are purchased from A. O. Smith.

If you'd like to know how A. O. Smith electrodes can be used to advantage on your work, call your "man from A. O. Smith." He'll show you that there's an electrode with the exact qualities to meet practically every production and special demand.







UPPER LEFT — Downstream view of two of the 21 tainter gates in the Fort Randall spillway. TOP RIGHT—View in Omaha Steel Works shops showing tainter gate assembly nearing completion. LOWER RIGHT—Overall view of partially completed dam.

to cage new source of power

The man from A. O. Smith

Jack Rees is the A. O. Smith welding representative who services Omaha Steel Works. More than a salesman, he's a welding specialist, ready and eager to help with any problem.

PRODUCED BY WELDERS—FOR WELDERS

Because welding is our full-time business, we offer you America's finest welder-proved electrodes, machines and accessories.

Through research A.O. Smith ... *a better way*

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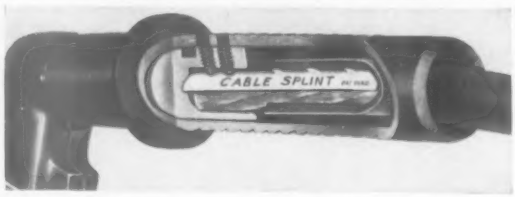
CORPORATION

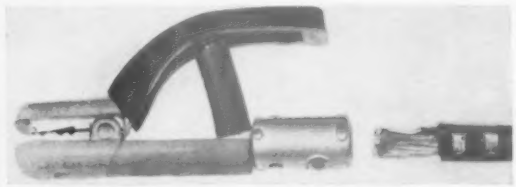
WELDING PRODUCTS DIVISION
Milwaukee 1, Wisconsin
INTERNATIONAL DIVISION: Milwaukee 1, Wisconsin

With the aid of these recent developments . . .



BERNARD's entry: the "Cable Splint" in position.

Is the cable problem licked?



"JACKET-Gripper" (*above*) and "Connection Support" (*below*) are recent innovations by Tweco.

A PROBLEM common to the welding industry since the beginnings of arc welding may soon be just a thing of the past.

The problem? . . . inability to secure efficient, lasting cable connections because of cable fraying.

With higher welding currents being used, and with the introduction of aluminum cable (more fragile than copper), need for a solution has been of vital concern.

Critical Point

In a manual welding cable circuit, the most critical point exists in the connection to the electrode holder. The weldor is constantly in motion, and twisting, pulling and jerking a cable eventually breaks external exposed strands immediately behind the connection.

As each wire breaks, cable capacity and connection decreases; heating of cable and holder increases. Loss of efficiency and rise of heat is rapid once breakdown starts.

Annealing effect of built-up heat tends only to accelerate strand breakage and deterioration of the cable jacket. Connection failure is inevitable, but only after the weldor has endured much discomfort.

Much time is consumed in machine setting readjustments and poor weld quality is a frequent result of this inefficiency—factors which add up to lost man-hours, dissatisfied weldors and higher costs.

The second point of circuit inefficiency through strand breakage is hidden by the cable's protective jacket. Constant bending and flexing of exposed cable behind the holder promotes and accelerates oxidation on each individual wire in the stranding.

This oxide wears upon internal stranding like so much abrasive powder. Oxide formation reduces individual strand size, and its action finally causes wire breakage.

Contrary to popular belief, core wires, around which the main conductor is twisted, are affected first and break before the external stranding does. Hidden in the stranding, these broken wires progressively build up heat and cause failure at that point.

When resetting a cable on a holder, then, 12 in. of cable should be cut back from the end so that full-size strands are used.

Stopping Breakage

Simple products, recently placed on the market, all but eliminate these breakage problems.

Bernard Welding Equipment Co., Chicago, has introduced its "Cable Splint"—a metal device driven into the cable between core wires and the jacket. It stiffens cable and prevents fine wires from breaking when twisted and bent (*see photo*).

An even more recent answer to the same problem consists of two items by Tweco Products, Inc. (Wichita, Kans.): the "Jacket-Gripper" and the "Connection Support."

The former is a simple lap-joint flat steel band applied to a welding cable *over* its protecting jacket. The band is impacted into place, causing the composite jacket and stranding to take on a shallow "U" shape (*see photo*).

The "Support" is a bridge similar to the Bernard "Splint," but instead of being driven into the cable under the jacket, a portion of it grasps the outer side of the cable jacket. The other end rides on the bare conductor wires.

Both "Splint" and "Support" are curved to conform with cable curvature. Barbs bite into the jacket (from inside or out, depending on the product used) to prevent jacket creeping.

These simple and inexpensive metal devices now on the market will extend cable connection life several times. This means elimination of much down-time and greatly reduced maintenance costs.

Weldor satisfaction with efficient, cool-running tools will make him much more effective. Cable replacement should be cut in half and jacket slippage should also be eliminated.

AO "Drednaut" Welders'
Gloves and Mittens are

Hand Protection for Welders

RIGHT ON HAND!

SC3013 GLOVE
Leather patch on back of hand gives added protection against sparks and molten metal. Thumb and first finger reinforced with leather patch. Additional reinforcing leather patch around thumb. Full gauntlet. Clute style. Overall length 14".

SCTX200 GLOVE
Gunn style 14" overall length. Flat double stitched seam at base of palm. One-piece back. Wing thumb. Lightweight for working ease.

SC5X163 GLOVE
Offers top resistance to heat on heaviest gas welding and heaviest amperage electric welding. One-piece back and palm. Welted at all vulnerable seams for extra protection. Heavy lining on back. Overall length 14".

3003 ONE-FINGER MITTEN
One-piece back and palm. Reinforcing leather strap around thumb crotch. Back of hand lined. 14" long. (Also available as No. 3004 as a full mitten.)

These Hand Protection products are made to the same high quality standards as American Optical Eye Protection equipment. They're RIGHT — in leather quality, thickness, length and construction. For American Optical gloves, only selected, specially chrome tanned cowhide splits are used that meet American Optical's rigid standards for maximum wear, heat-resistance, flexibility and comfort.

Gunn pattern models for heavy-duty welding and burning have a double thread sewed flat seam at base of palm . . . and for increased comfort, one-piece backs with heavy linings from wrist to finger tips. Wing thumb pattern reduces hand fatigue, increases glove life.

All gloves are bound at cuffs with cotton tape. Mittens while not *specially* chrome tanned are made of a heavier grade cowhide. Four of the ten products in the line are illustrated.

Always insist on
Trademarked Safety Products

American Optical
COMPANY
SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS
BRANCHES IN PRINCIPAL CITIES

This radiographic giant will see to it that weldments and castings used in our nation's defense program are flawless and equal to their task!

2 million volts for quality control

NONDESTRUCTIVE testing of vital defense materials and structures is now being conducted in a big way at the U. S. Naval Magazine, Port Chicago, Concord, Calif.

Recently installed and dedicated, a 2,000,000-volt X-ray installation will perform quality control checks on welded and cast components for guided missiles and atomic-powered naval ships and submarines.

Capt. E. B. Mott, commander of the Magazine, has predicted major savings in over-all costs of quality control through use of the new facility.

Concrete Housing

Built by General Electric Co.'s X-ray Dept. in Milwaukee, Wis., the multi-million-volt unit is housed in a concrete building large enough to permit entry of a rail car or large truck carrying items for testing.

Also in this building, which required 1,200 cu yd of concrete in construction, is a 250,000-volt X-ray machine.

Safety is assured in this X-ray housing: 3 walls are 2 ft thick. The fourth, which separates control and exposure rooms is 4-ft-thick concrete slab. It has radiation traps and lead-lined doors for added protection.

New Test Programs

Said to be highly maneuverable, the large X-ray unit is mounted on a power crane for quick positioning at virtually any angle. Materials being radiographed are handled by a separate 10-ton crane.

To take full advantage of this 2,000,000-volt unit, the Navy's Bureau of Ordnance has inaugurated several nondestructive test programs for vital material. Previous requirements demanded costly destructive tests or the dismantling of test items. The new unit packs enough power to X-ray a complete diesel locomotive!

A nondestructive test symposium will soon be held at the Port Chicago Magazine, according to Capt. Mott. Invited to attend will be radiographers, metallurgists, engineers, scientists and others interested in the subject.

"Purpose of the symposium," Capt. Mott explains, "is to provide non-destructive test leaders in industry and the military with an opportunity to exchange information on efficient utilization and practical application of high-voltage X-ray equipment to obtain more defense for the defense dollar."

Services of the X-ray plant will be extended to other agencies of the Defense Dept., and to commercial firms holding government contracts.

DWARFED by 2,000,000-volt X-ray unit are Capt. E. B. Mott, commanding officer of Naval Magazine, and E. W. Milburn, representative of General Electric Co., which constructed machine. Capt. Mott holds control panel.

NAVAL officers inspect 66-ton, 2-ft-thick concrete door on building housing X-ray unit. Personnel safety is carefully controlled.

LIGHTWEIGHT

WELDING CABLE!

Made of Kaiser Aluminum—one-third lighter than copper!

Greatly reduces fatigue—Easier to lift and drag around . . . an important factor in reducing fatigue, increasing job efficiency.

Makes work easier—To demonstrate flexibility, it can be looped into a small circle with thumb and forefinger.

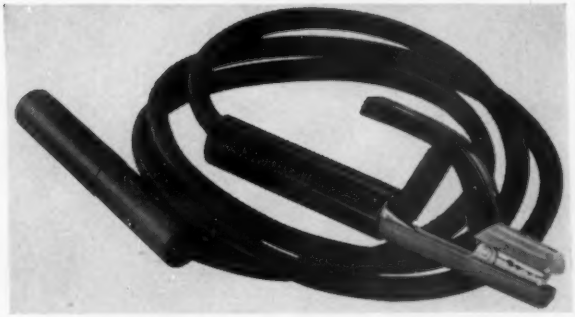
Tough GRS rubber or Neoprene jacket—Resists abrasion, acids, sunlight and heat. Neoprene jacket is flame-resistant and impervious to oils and greases.

Simple connections—Takes good mechanical and soldered connections—either aluminum to aluminum or aluminum to old copper cable.

Saves money—The favorable price of aluminum, when compared to copper, provides important economies.

Install aluminum whip-leads now! Until your copper cables come up for replacement, your existing copper lines can easily be equipped with light, flexible aluminum whip-leads by means of simple mechanical connections. Weldors can tell the difference immediately! And as your copper cables are ready for replacement, you can take full advantage of aluminum for the entire line.

For complete information on new aluminum welding cable, contact your welding equipment manufacturer or your nearby welding supply distributor. Aluminum welding cable is produced for equipment manufacturers by Kaiser Aluminum at the company's Newark, Ohio wire and cable mill.



Whip-lead of Kaiser Aluminum welding cable with Twecotong Al-300 forged aluminum electrode holder and Tweco Me-Con connector by Tweco Products, Wichita, Kansas.

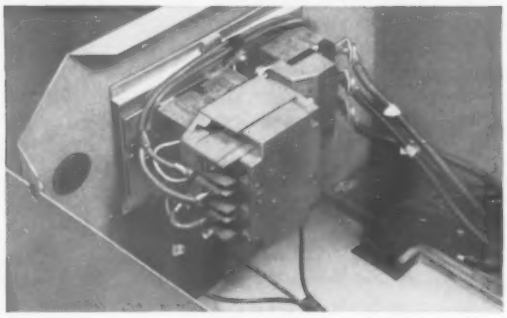
Kaiser Aluminum is a leading producer of electrical conductor for transmission, distribution and service drop lines. In addition, Kaiser Aluminum produces building wire and other aluminum conductor products for industry.

At your request, we will be glad to send you our informative folder, "New Advantages in Arc Welding Cable with Aluminum Welding Cable." Write to Kaiser Aluminum & Chemical Sales, Inc., *Executive Office*, Kaiser Building, Oakland 12, California; *General Sales Office*, Palmolive Building, Chicago 11, Illinois.

IF IT CARRIES CURRENT, KW CARRIES IT!

Kaiser Aluminum

See "THE KAISER ALUMINUM HOUR." Alternate Tuesdays, NBC Network. Consult your local TV listing.



IMPROVED MAGNETIC STARTER has quick response bi-metallic thermal overload relays which sense current changes and to help prevent motor burnout in case of sustained overloads or accidental single phasing. Large starter contacts are long-lasting, won't chatter.

ANNOUNCING A NEW LOOK IN M-G WELDERS!

New General Electric M-G Set Speeds Welding with Stable, Penetrating Arc—In Any Position

General Electric's new motor-generator welder gives you the stable, penetrating arc you need to get even those tough, out-of-position welding jobs done faster and better.

The secret? General Electric's NEW laminated frame welding generator, working in combination with a unique transformer reactor.

The arc is stable because this new reactor provides excellent control of current surges and assures immediate high recovery voltage at all settings. No need to worry about costly delays caused by electrode freezing or popouts.

A high level of "arc force," with the stable arc, makes the General Electric m-g set ideal for a wide variety of industrial applications, including light, medium, and heavy d-c metal-arc and inert-arc welding.

And here are just a few other reasons why the new G-E motor-generator welder answers your need for high-quality welds in less time and at less cost.

EASY TO USE—current is not sensitive to changes in line voltage—once the simple current setting has been made, no further adjustment is necessary. Arc has quick response and good control in all positions.

FUNCTIONAL DESIGN—two welding sets can be installed in the space normally required by one, saving valuable floor area—brushes can be changed while welders are stacked—cooling air enters the ends, exhausts front and back, to prevent recirculation.

LESS MAINTENANCE—constant pressure brush springs give maximum brush life—rubber-mounted, extra-width, pre-lubricated bearings require no maintenance—motor windings are Mylar* insulated and Dri-Film† coated to help prevent insulation failures—heavy-duty motor starter contacts last for years.

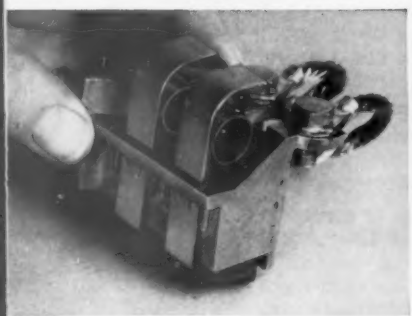
General Electric's new d-c motor-generator sets are available in both 300 and 400 ampere designs, rated 40 volts, 60% duty cycle. For more information about them, contact your nearby General Electric Welding outlet, listed in the yellow pages of your telephone book. Write for descriptive bulletin GEA-6423 to Section 711-8 General Electric Company, Schenectady 5, New York.

*Reg. Trademark of DuPont Co.

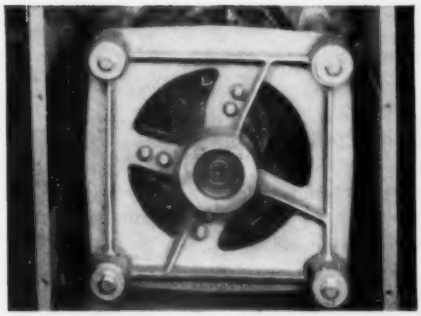
†Reg. Trademark of General Electric Co.

Progress Is Our Most Important Product

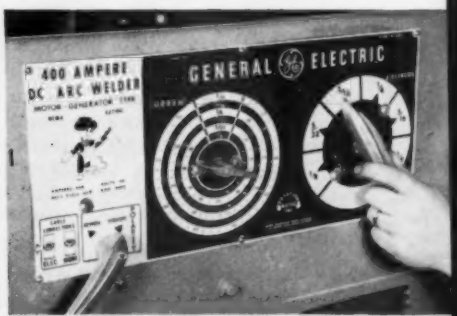
GENERAL ELECTRIC



CONSTANT-FORCE brush springs need no adjustment; give the correct constant pressure during brush life. Removable spring clips permit easy replacement of brushes.



STURDY CONSTRUCTION results from one inch diameter steel rods which link the bearing housings with welded generator and motor frames. Sturdy ¼" angles are welded to the generator frame to provide a solid base.



DUAL CONTROL DIAL is fully calibrated, easy to read. Just select electrode size on Electrode Selector, then set sensitive long-scale current control for desired welding current.

Here's a run-down of some major events that helped make the Metal Congress and Exposition in Los Angeles . . .

CONVERSING at luncheon marking the start of AWS participation in Metal Congress activities are *(left to right)*: C. P. Sander, newly-elected president of AWS; J. J. Chyle, current AWS president whose term expires May 31, and C. B. Smith, chairman of the Los Angeles AWS section.

The best in the West

FROM March 25 to 29, Los Angeles was host to the largest metal meeting ever held on the West Coast. The occasion was the tenth Western Metal Exposition at the Pan-Pacific Auditorium, and the Western Metal Congress which convened at the Ambassador Hotel.

An extensive program, covering practically all phases of the metal-working industry, had the cooperation of practically every engineering society with a western division. Daily technical sessions were held by the American Welding Society, American Society for Metals, and the Society for Non-Destructive Testing.

Other organizations participating in scheduled programs included the American Institute of Mining, Metallurgical and Petroleum Engineers and the Industrial Heating Equipment Association. The American Welding Society, with its 25 technical papers, was the only organization to hold technical sessions on all five days.

Welding and Progress

AWS sessions began Monday at noon with a kick-off luncheon at which C. E. Ducommun, president of the Los Angeles Chamber of Commerce, extended his greetings. Following an added welcome from the mayor's office, AWS President John J. Chyle told of the interesting role welding is playing in our everyday lives in a presentation entitled, "The role of welding in industrial advancement."

The only technical paper of the Monday afternoon session, which was under the chairmanship of G. Milton Sims, Absco, Inc., Los Angeles, was presented by Ted B. Jefferson, editor and publisher of WELDING ENGINEER and THE WELDING DISTRIBUTOR. Mr. Jefferson's presentation, "Welding codes—stimulant or stumbling blocks," resulted in the lengthiest discussion period of the entire meeting.

Other welding sessions were devoted to aircraft and rocketry problems with special emphasis on resistance welding—particularly of titanium alloy structures.

Brazing Session

Stress was placed on uses of welding in the aircraft industry, but a highly diversified group of subjects also was covered. They ranged from inert-gas welding and general welding developments to problems encountered in welding for nuclear pumping applications.

The Industrial Heating Equipment Association devoted a special session to brazing and sintering, and a number of the problems discussed by the Society for Non-Destructive Testing included those arising from welding applications.

Major interest in the program centered around titanium and other super alloys used in ultra-high-speed aircraft and nuclear fabrications.

Western Metal Show exhibitors overflowed the Pan-Pacific Auditorium and some had to be quartered in what appeared to be three tents. Show managers, however, dignified them with the name "pavilions." About one-sixth of the 300-plus exhibits were of interest to those in the welding field.

The Los Angeles Section of the American Welding Society received many congratulations upon the excellent program it arranged for AWS members and guests. Registration included persons from all over the United States, and from Hawaii.

The next Western Metal meeting is planned for 1959.

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Then, the Custom Silver "W" also gives you quick polarity selection—built-in, automatic water and gas controls (that clear the line both before and after use)—even an automatic timer for spot welding!

Yet above all this, the Custom Silver "W" incorporates the *easiest settings ever*, with the widest current range overlap in the industry! *Positive* instantaneous arc start, from the Westinghouse pre-energized reactor! And *utmost arc stability known!*—from the Westinghouse, exclusive smoothing reactor—and now from Westinghouse SILICON Rectifiers!

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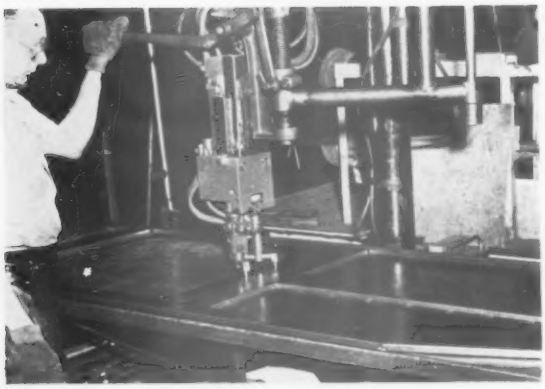


MOUNTED on existing pantograph drill press frame and modified for lever-operated clamping pressure, portable spot welder joins stiffeners to truck door frame.

When marks are taboo . . .

One-sided spots make cleaner welds

By a Staff Member

FABRICATORS of sheet metal cabinets, metal furniture and auto body components possess a natural desire to employ the speedy, efficient resistance spot welding process wherever possible.

But this application is often seemingly impossible when multiple spot welds are required . . . and when the face side of a completed assembly must not show a weld mark.

Boyertown (Pa.) Auto Body Works, a large fabricator of bodies for delivery vehicles, had to meet both of these requirements, and one additional: the firm had only limited available power. If spot welding could be used at all, it must have a low-power-demand factor.

Twin-Spot Welder

In view of these stringent requirements, Boyertown Auto was more than pleasantly surprised when it discovered that spot welding *could* be used. A portable, twin-spot series welder was found that operated within the limits of local power supply, and in conjunction with a special fixturing set-up, it made welds visible only on the inside of body parts.

Supplied by ARO Spot Welder Div. of Guthery Machine Tool Corp., the spot welding gun has a self-contained transformer. This incorporation has eliminated much of the current loss encountered with guns operating from cables.

Without any measurable allowance for current loss, the 53-lb spot welder in use at Boyertown Auto has relatively low primary current requirements. Welding currents high enough to meet production needs, however, are regularly obtained.

As shown in photos accompanying this article, the firm does not use this spot welder as a portable unit. Instead, it has been mounted on the frame of a pantograph drill press which was already installed in the plant.

Current and Pressure

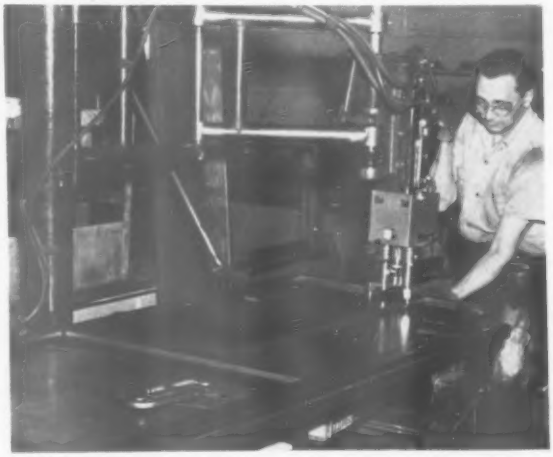
The manual clamping lever shown here has since been replaced by a pneumatic cylinder which has made the welding operation easier and faster. Insufficient manual pressure (approximately 120 lb are required) never produced faulty welds, however, because two microswitches in the gun (each controlled by a spring-loaded, telescopic electrode carrier) make and break welding current only when sufficient welding pressure is reached.

Beneath the press-mounted welder is a clamping table clad with $\frac{1}{8}$-in. copper sheet. When parts are positioned on the table and welding begins, the conductive cladding aids current transfer between electrodes.

The door panel and T-shaped channel stiffeners shown in the accompanying illustration provide a good example of this welding arrangement. The twin spot welding electrodes are positioned on stiffener flanges. As pressure is applied and welding begins, current flows through one electrode and the flange beneath, and into both the door panel and the table cladding.

Following the path of least resistance, current travels toward the remaining instrument of high conductivity: the other electrode. The complete circuit has thus been made, and since electrodes are applied only to one side of the work, weld marks will appear on this side alone.

In the use of this gun, Boyertown Auto has noted substantial savings in setting-up for welding, in using only the power supply already available, and in producing clean work at high speeds.



COPPER-clad clamping table aids current transfer between electrodes bracketing channel stiffeners. Spot weld marks are made only on one side of metal.

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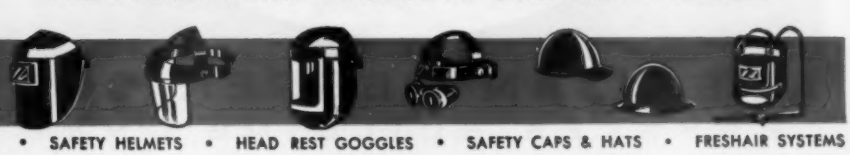

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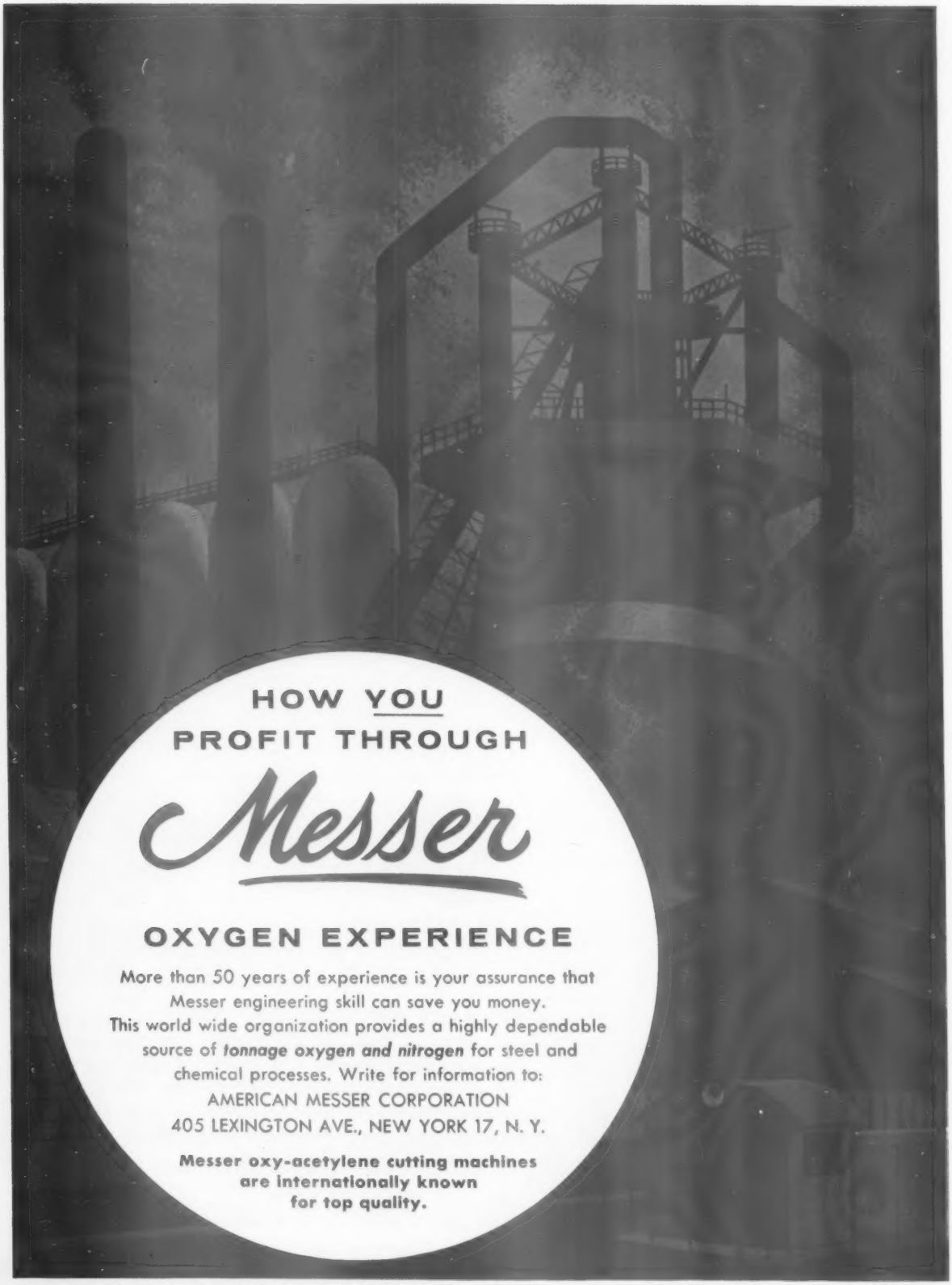
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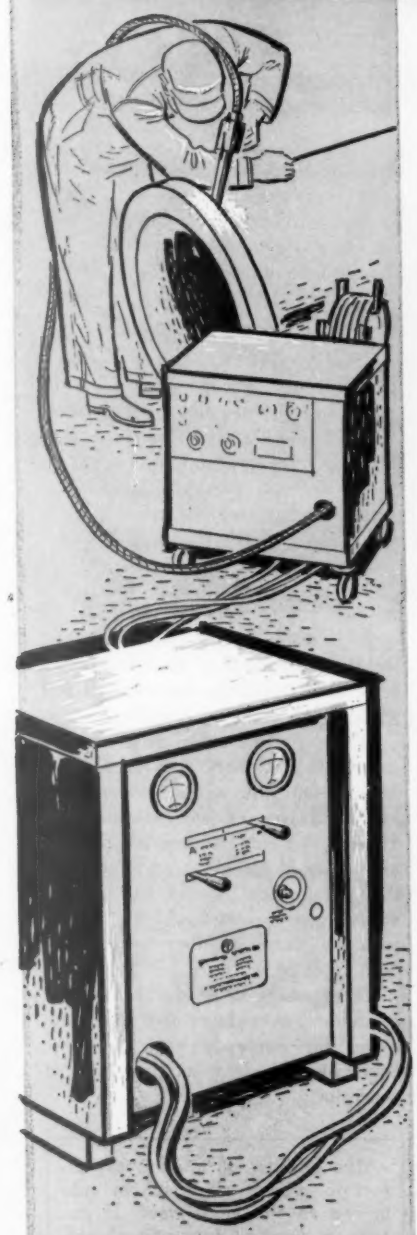

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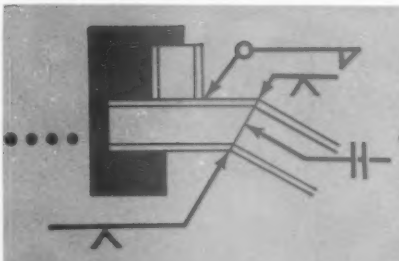

the welding clinic

Here you may find the solution to your welding problems, whether they concern design, production, construction or maintenance welding. Submit your questions for answering on this page.

Rules for estimating weld strength

Question:

Our construction firm handles quite a few welding jobs but, frankly, we do not know the true strength of the welds we make. It is known that these welds are more than strong enough for their purpose, but it is impossible for us to quote exact strength figures when we are queried on this point. Could you give us some method of estimating strengths—and tell us, also, the strengths of 1/8 and 3/16-in. fillet and butt welds, each 1 in. long?

Answer:

There are many factors affecting weld strength: base metal, type of deposit, type of electrode and possible weld imperfections. Permissible loading will also vary with the safety factor involved.

To be on the safe side, we would suggest a safety factor of four. In other words, when working with ordinary mild steel which has an ultimate tensile strength of approximately 60,000 psi, you should not exceed a static loading of 15,000 psi.

In using a safety factor of four, there is a good "rule of thumb" that should help you easily determine strengths of 1-in. fillet and butt welds.

Convert the size of a fillet weld to its decimal equivalent and multiply this figure by 10,000. For example, the decimal equivalent of a ⅛-in. fillet is 0.125 in. In multiplying this figure by 10,000, you obtain an answer of 1,250 lb.

Here are further examples:

3/16 = 0.1875 x 10,000 = 1,875 lb
1/4 = 0.25 x 10,000 = 2,500 lb
5/16 = 0.3125 x 10,000 = 3,125 lb

These same figures can be used for estimates on butt welds; under shear conditions, however, butt welds will be somewhat stronger than fillets. You may readily assume that butt welds will have the same strength as the plates they join.

Question:

Our firm does some welded fabrication on a contract basis at present and we would like to expand this work. Unfortunately, we are unable to bid on some jobs because specifications call for "code" welding which we cannot provide. These specs are particularly prevalent on the welding of coils and formed tubing for pharmaceutical and chemical processing fields. Could you tell us what percentage of welding done today is "code" welding, and if "code" welding is more prevalent in the pharmaceutical, food processing and chemical fields than in other areas? We are also wondering if "code" weldors can be used on non-code jobs at non-code job rates.

Answer:

It is very difficult to determine the percentage of so-called "code" welding. This term is used to describe the qualification of a welding procedure, and means that a weldor working on a certain type of material is qualified to make satisfactory welds with a certain type of machine, a particular welding electrode, and following a prescribed welding sequence.

If any of the factors listed above are changed, the weldor must be requalified. In reality, then, "coding" is not so much a weldor's test as it is a qualification of procedure used in a specific shop.

Practically all welding done in the pressure vessel and pressure piping field demands qualified weldors, since this work must be covered by a casualty insurance company. Code welding is always required where insurance is involved.

100% Code Welding

Pharmaceutical plants, chemical and food processing plants, oil refineries and power plants make broad use of high-pressure steam lines. They also have other piping which carries fluids at high pressure, as well as boilers and containers handling these materials at high pressure, so code welding is essential.

Thus, for the industries you name, almost 100% code welding is required. And, in the overall picture, welding applications in these industries may constitute between 10 and 25% of all industrial welding.

If a department for code welding is established, there is no reason to believe that the weldors it employs could not be used on non-code jobs. If there is a rate differential for code and non-code welding in your area, the union local would be able to advise you on rates which must be paid to those weldors performing both types of work.

There seems to be no reason why a weldor should receive premium wages for non-code work in those areas where code work does draw a premium.

The Editors will make every effort to answer all questions submitted to this department. If you have a question concerning welding or related processes—or a tip you would like to pass along to other readers—send it to *The Welding Clinic*.

automatic

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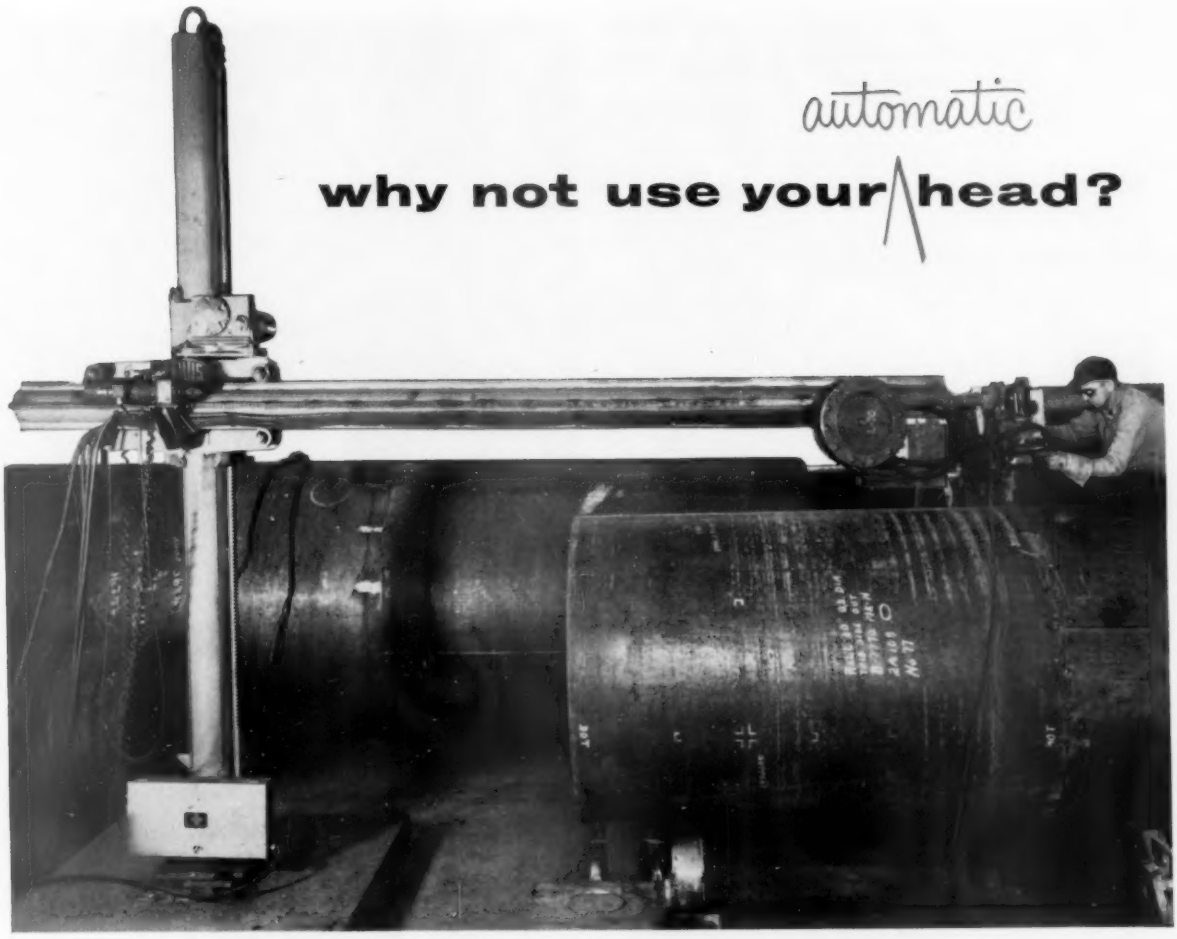

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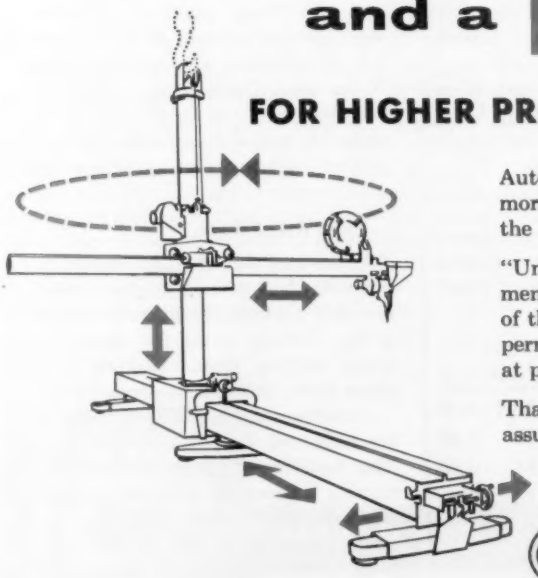

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USING nickel-iron electrode, weldor finishes 12 hours of work on broken cast-iron fender from fork-lift truck. Repair of 750-lb unit consumed almost 5 lb of filler metal. *(Weldor has removed gloves to make final pass).*

—Courtesy International Nickel Co.

For cast iron welds . . .

Filler metals for joining

By Orville T. Barnett*

FILLER METALS for cast iron welding are available in quantities and variations that lead to a pardonable confusion.

When cast iron filler is used, cast iron welding becomes a straightforward combination of base and filler metals. But cast iron is also welded with steel, brass, bronze, nickel and Monel—to name the more common and dissimilar filler metals.

Discussed in this article will be filler metals listed in the *Tentative specifications for welding rods and covered electrodes for welding cast iron* (ASTM designation: A 398-56T; AWS designation: A5.15-56T). This material is as up-to-date as 1956.

(Of course, there are many more varieties available. But only types carrying official AWS recognition through specifications will be mentioned.)

Nature of Cast Iron

Before examining filler metals, it seems worthwhile to consider the nature of cast iron. Gray iron, the most common form, contains both combined carbon and free graphite. Both contribute desirable engineering and machining properties.

At the same time, the high combined carbon and uncombined graphite spell an almost zero tensile ductility so far as the welding engineer is concerned. The sharp "ping" of a cast iron weldment cracking while cooling has provoked many a weldor to earthy and indignant outbursts!

Cast iron is welded regularly and successfully. But it is not a job for a *bush-leaguer*. Such welding requires careful planning and meticulous execution. Even then, a few failures may be necessary to drive the essential precautions home—just as every baby has to touch a radiator to understand the significance of the warning word "hot."

Gray iron, white and chilled iron, malleable iron, pearlitic malleable iron, nodular iron and alloy cast irons are produced as engineering parts. Where special properties result from heat treatment—as is the case with malleable and some nodular irons—welding heat may destroy these properties.

TABLE I—Typical analyses of cast-iron-base filler rods and electrodes for welding cast iron.

	AWS—ASTM Classification	
	RCI/ECI	RCI—A
Carbon (%)	3.38	3.38
Manganese (%)	0.68	0.60
Phosphorus (%)	0.63	0.30
Sulphur (%)	0.10	0.10
Silicon (%)	2.88	2.25
Nickel (%)	—	1.40
Molybdenum (%)	—	0.35
Iron (%)	92.33	91.62

Embrittled Zone

White and chilled iron has a large amount of combined carbon which makes it particularly brittle. Since it is the starting point for malleable irons, welding these materials may cause a very brittle heat-affected zone.

Sometimes malleable iron castings are repaired *before* malleabilizing. The heat-treated irons demonstrate varying degrees of ductility, including some good values. Even so, for the purposes of welding, all cast iron must be treated as brittle metal.

Gray cast irons range in strength from 20,000 to 60,000 psi under the appropriate ASTM classifications.

*Assistant manager, Metals Research Dept., Armour Research Foundation of Illinois Institute of Technology, Chicago.

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At the time this versatile magnetic-amplifier-rectifier welder was first introduced, Ford had just completed a survey of all the welders on the market. From this study followed recognition of the need for a welder that would provide: better arc stability, retention of arc characteristics under line voltage fluctuations, wider current range and good performance at very low currents, quick speed of response and recovery from arc short, control of volt-ampere curve and easy remote foot control. It was evident that a *true* magnetic amplifier welder would most closely meet the special requirements of their aircraft fabrications.

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Castings may be less than a pound in weight, or they may weigh several tons. All welding processes applied to them are aimed at keeping base metal heat stresses within bounds.

This is done by extensive preheating to what may be rather high temperatures for larger weldments. Another approach is to put in such small increments of weld metal that the casting never gets too hot for continuous hard contact (this would be below 140 F setting of your domestic hot water heater). Frequently, a filler metal with excellent ductility is used to provide filler metal *stretching* and avoid base metal *straining*.

4 Main Groups

There are four main groups of cast iron filler metals: *(1)* cast iron; *(2)* copper base; *(3)* nickel base, and *(4)* steel.

Cast iron welding rods seem to be used in greater quantities than cast iron electrodes. This may be due to ingot mold repairs and other applications requiring the use of substantial quantities of filler.

Because of large machine frames, huge gears and other massive applications, the low-fuming bronze welding rods appear to be the most popular choice in the copper-base group. Nevertheless, copper-base arc welding electrodes enjoy a well-deserved reputation in cast iron weldments where color match is not a problem and the intense arc heat can be accommodated.

Nickel-base and steel filler metals are used as arc welding electrodes only.

Spec Interpretation

In a cast iron filler metal specification, a prefix "R" denotes a gas welding rod, while the prefix "E" indicates a coated, metal-arc welding electrode. Succeeding letters are commonly chemical symbols for the most important elements in the filler metal—*e.g.*, R Cu Zn is a brass welding rod, and E Ni Cu is a Monel-coated arc welding electrode.

Where there are several filler metals in a family group, suffix letters are tacked on. Still further classifications in a complex group necessitates a suffix letter and number (*examples are*: R Cu Zn, R Cu Zn-A, R Cu Zn-B, etc., as well as R Cu Al-A2 and E Cu Al-A2).

Because the terms cast iron and steel do not readily lend themselves to chemical mnemonic terminology, they are denoted by CI and St, respectively.

—*Courtesy Anaconda*

BRAZE-weld on conveyor drive sprocket was completed in 7 hours —4 for preparation, 3 for welding. Job consumed 20 lb of low-fuming bronze rods 3/16 and ¼ in. in diameter.

Two analyses of cast iron filler metals are available, as shown in Table I. The straight cast iron analysis may be used for gas or for arc welding. Alloyed cast iron rod, however, may be used for gas welding only.

Good Color Match

Cast iron filler metal of the RCI classification offers a good color match, along with a composition and metallurgical structure quite similar to the gray cast iron base metal it joins. A machinable weld deposit with physical properties as good as the gray iron casting itself results from correct welding practice.

This rod does a good job for gray iron castings in the 20,000 to 40,000-psi range where corresponding Brinell hardnesses run from about 150 to 250. Where grooves are required, they should be wide: 60 to 90 deg or even more in heavy weldments.

Preheating is a must for large castings no matter what type of filler metal is used, unless only a very small amount of weld metal is required. Smaller castings may or may not be preheated, depending upon whether a "hot" or "cold" technique is employed.

Slow Cooling

A "hot" technique signifies either gas welding or multiple-pass arc welding. A "cold" technique describes arc welding in which bead increments

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TABLE II—Typical analyses of copper-base filler rods and electrodes for welding cast iron

AWS—ASTM Classification	Copper %	Zinc %	Tin %	Iron %	Aluminum %	Nickel %	Manganese %	Phosphorus %	Silicon %
R Cu Zn — A	57.0	43.37	—	—	—	—	—	—	—
R Cu Zn — B	56.0	41.87	0.75	0.63	—	0.50	0.25	—	—
R Cu Zn — C	56.0	41.09	0.94	0.75	—	1.00	0.25	—	0.15
R Cu Zn — D	45.0	44.60	—	—	—	10.0	—	0.25	0.15
R Cu Al — A2	88.4	—	—	1.5	10.0	—	—	—	0.10
E Cu Sn — A	94.45	—	5.3	—	—	—	—	0.25	—
E Cu Sn — C	91.65	—	8.0	—	—	—	—	0.35	—
E Cu Al — A2	88.4	—	—	1.5	10.0	—	—	—	0.10

are short and the entire casting is kept cool.

Preheating and slow cooling are partners in a cast iron welding process. Whenever preheat is used, plan for slow cooling. Small parts may be buried in powdered lime or sand, or covered with powdered asbestos. Large cast iron structures are often postheated in a furnace and temperature is lowered slowly.

Ordinary gray iron castings to be gas welded are best preheated at temperatures of from 800 to 1,100 F. Temperatures may run to 1,400 F or more for alloy iron castings or massive sections.

Although preheat is intended to balance expansion and contraction stresses, it does speed up the gas welding deposition of filler metal. If heating of the whole casting is impractical, specific sections can be treated. However, it may then be necessary to preheat areas which will not be welded to balance expansion and contraction conditions.

Welding Procedure

Heating the area to be welded to a dull red color is the first step in the gas welding procedure. A neutral or slightly reducing flame is used. Filler rod is heated, dipped in a powdered flux, and melted onto base metal.

A good weldor keeps melting base and filler metal in proper proportion, picking up flux with the heated filler rod as needed.

Both new and worn castings have holes filled, or are built-up, with RCI rods. Cast iron fabrication, maintenance and repair are also done with this filler metal.

Arc welding with ECI electrodes may be done on either a-c or d-c, reverse polarity, because of the design of the heavy coating. Usually, filler metal is an RCI rod properly coated to provide good arc stability, weld metal additions and a suitable slag.

In general, welding practice is similar to that described for gas welding with RCI rods. Weldments should be kept hot throughout the welding operation when preheat is specified. Cast iron weldors often work in teams, spelling each other so that, once a weld is started, it may be completed without interruption.

Easily Machinable

Fabrication and repair work on cast iron is performed with ECI electrodes. Where small defects are being patched, or where little welding is required, arc welding will be faster than oxyacetylene welding. When preheat and slow cooling have been properly employed, weld deposits are easily machinable.

For higher-strength cast irons or alloyed types, RCI-A electrodes are the choice. Sometimes this alloyed cast iron electrode is preferred by weldors because weld metal is more fluid than the RCI type and welding progresses more rapidly.

Except for a higher melting point associated with the RCI-A electrode, however, there is practically no difference in recommended welding procedures. Notwithstanding a Brinell hardness of about 230 for the weld deposit, the welds are generally considered machinable.

Copper-base filler rods and electrodes are listed in Table II, along with their typical chemical analyses in greatly simplified form. These analyses are intended to show the differences among filler metals only. Detailed analyses for specification purposes may be found in the ruling specification.

Braze-Welding

A current and very popular procedure is the braze-welding of cast iron with copper-base filler metals. Of course, the difference in color between weld and base metals has led some to state that the repair "sticks out like a sore thumb." However, production delays that have been shortened by a skillful, braze-welded repair have led many plant engineers to view the bronze-colored welds as badges of honor.

Most copper-base alloys are strong and ductile. While these weld areas are hot, they are soft and ductile. During cooling, weld metal stretches

TABLE III—Typical analyses of nickel-base electrodes for welding cast iron

AWS—ASTM Classification	Nickel %	Copper %	Iron %	Silicon %	Manganese %	Carbon %
E Ni	98.0	0.50	0.50	0.75	0.50	0.15
E Ni Fe	56.0	0.50	41.75	0.50	1.00	0.25
E Ni Cu — A	58.0	36.20	2.50	0.75	2.25	0.30
E Ni Cu — B	68.0	26.20	2.50	0.75	2.25	0.30

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—Courtesy Anaconda

LOW-FUMING bronze welding rods (*R Cu Zn-C*) are used here to braze-weld damaged area on a cast iron side frame from a punch press. Note large heating tube at lower left.

while the cast iron base metal remains almost stress-free. As filler metal temperature falls the last few hundred degrees, it reaches proper strength level. Thus, filler metal *gives,* and base metal doesn't crack.

Copper-zinc rods are used to braze-weld cast iron when color match, corrosion resistance *(electrolytic)* or high-temperature performance is unimportant.

The original 60 copper/40 zinc analysis has been modified with small amounts of iron, tin, silicon, nickel and manganese to improve corrosion resistance, fluidity, wettability, deoxidation of the molten weld deposit and mechanical properties of weld metal.

Most Popular

R Cu Zn-C (*low-fuming bronze*) welding rods appear to be the most popular in this group. Weld deposits are strong and corrosion resistant. Hardness averages about 100 Brinell. Like all welding rods in this group, they are suitable for oxyacetylene welding only, and require a neutral or slightly oxidizing flame. They can be applied with a separate powdered flux or in the form of flux-coated rods.

R Cu Zn-A *(naval brass),* R Cu Zn-B *(manganese-bronze)* and R Cu Zn-D *(nickel-bronze)* welding rods are also available. The latter is a low-fuming rod with a white-colored deposit that provides a better color match.

Remaining copper-base filler metals are suitable only for arc welding. E Cu Sn-A, E Cu Sn-C and E Cu A1-A2 are used as coated electrodes, while R Cu A1-A2 is a filler rod for carbon-arc welding of cast iron. These electrodes and rods were originally developed for other applications, but were found useful for cast iron welding.

Nickel-Base Electrodes

As Table II indicates, there are four types of coated nickel-base arc welding electrodes designed for cast iron applications. Historically, the E Ni Cu were first upon the welding scene.

This Monel-type electrode (a generic term, since one electrode is not Monel) provided a soft, machinable deposit without undue hardening of base metal. Both weld and heat-affected zones could be machined.

Next on the market were E Ni-type electrodes . . . an almost pure nickel electrode with excellent welding characteristics. Fusion was good and penetration was held to a minimum.

Arc stability of the E Ni electrode proved to be very good, deposits were smooth and slag removal was easy. Color match, also, was close enough for acceptance. During times of national emergency, however, this high-nickel electrode is even scarcer than copper-base types.

Tensile strength of E Ni weld deposits is almost twice that of cast iron base metal, and weld deposit hardness is approximately 165 Brinell. If proper welding proceure is used, hardness of the heat-affected zone can be held to a machinable maximum of 220 Brinell.

Required Less Nickel

Sometime after the appearance of E Ni electrodes, the E Ni Fe classification was introduced. As Table III shows, this type required appreciably less nickel—no doubt an important contributing factor in its development.

Although E Ni Fe electrodes overlap the E Ni in many applications, the former type performs well on high-phosphorus cast irons, ductile iron, etc.

Nickel-base electrodes operate well with a-c or d-c. Most of them may be used in all positions. Not only are they useful in repairing such casting defects as blowholes, scabs, cracks, but they allow cast iron fabrication and the joining of steel to cast iron Nickel-base electrodes will also join heavy cast iron sections.

Preheating and slow cooling are common welding procedures when nickel-base electrodes are used. This heat treatment is often a guarantee of the best machinability. Certain welds are made without preheat by keeping base metal cool, and in such cases, acceptable machinability can also be achieved.

Low Melting Point

The last group of filler metals for joining cast iron is the E St variety. Although the chemical analysis listed in Table IV might suggest that this is an ordinary mild steel electrode, such is not the case. Coating design with low melting point characteristics makes a signifiant difference. Weld deposits made with this electrode type must be ground—they are much too hard to be machined.

An E St electrode is the least expensive of available cast iron filler metals—and it also has the most limited utility. Generally, it can be used to fill small holes or pits. Small cracks can be patched, but no repair can be finished by machining.

Because base metal cracking is virtually unavoidable, *studding* has become a repair technique associated with E St welding. Studs are screwed into the cast iron base metal on each side of the fracture. Weld metal, then, ties studs together with a steel overlay.

Such joints are not liquid tight. As a matter of fact, they are doomed to extinction in the light of other filler metals less wasteful of labor.

Cast iron welding *can* be done. Careful preparation of the joint must be integrated with a well-thought-out welding procedure designed to avoid fracturing base metal by over-stressing.

TABLE IV—Typical analyses of steel electrodes for welding cast iron.

AWS—ASTM Classificatiton

	E St
Carbon (%)	0.15
Manganese (%)	0.45
Phosphorus (%)	0.04
Sulphur (%)	0.04
Silicon (%)	0.03

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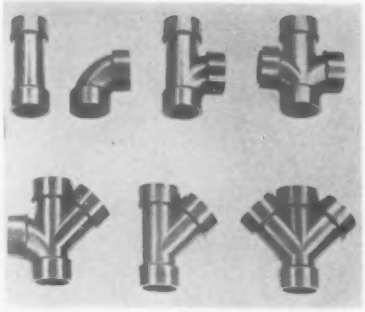

WELDING fitting is socket-type, available in elbows, t's and y's, in sizes 1½ to 4 in.

Weld economy on plastic pipe for drainage

COST-CUTTING has become a fact for firms draining corrosives with polyvinyl-chloride piping and socket-type welding fittings, reports Tube Turns Plastics, Inc., Louisville, Ky.

Pvc piping is replacing cast iron and ceramic lines in many installations which formerly used bell and spigot fittings.

The welding fittings, made by an injection molding process owned by TTP, are claimed stronger on a strength-to-weight basis than pvc fittings produced by usual processes.

Ease of installation is only one reason for the switchover, states TTP. Pvc pipe and fittings cost less and there is less labor per joint.

A recent survey indicates a journeyman plumber can produce 12 bell and spigot joints a day on 2-in. schedule 40 alloy cast iron pipe. Since pvc pipe and fittings are easy to move, align and join, however, joint rate is doubled.

Firepot, caulking tools and a hammer are only a few of the tools required for a bell-and-spigot joint. Just a can of cement and a brush are needed for pvc pipe and fitting.

Pvc pipe is available in 10 and 12-ft lengths, requiring fewer joints. Useless deadweight is eliminated: pvc systems weigh only one-tenth as much as comparable cast iron or ceramic systems.

Pvc pipe and fittings have good impact strength, and lines using the new fitting have no internal crevices to impede waste flow.

LEFT: Single operator adjusts torch height and gas stream to flame-cut this slab of 40-in.-thick cast iron. Torch carriage can move 8½ ft on boom, which will rotate 360 deg around rail car. BELOW: Cut progresses through scrap material, generating volumes of iron-oxide smoke. Flame-cutting machine can be taken off rail car whenever necessary.

There's very little that can't be done by this . . .

Rail-mounted flame-cutter for heavy steel scrap

MANUAL flame-cutting was once used exclusively by Deitch Co. of Pittsburgh to reduce large hunks of iron and steel scrap to pieces which could be recharged into open-hearth furnaces.

Much of this slower manual operation has now been replaced by a semi-portable flame-cutting machine. Manufactured by National Cylinder Gas Co., the cutting unit can be mounted on a rail car for quick travel to work areas in the Deitch yards.

360-Deg Rotation

A torch carriage moves the unit the full length of an 18-in. structural steel guide rail (and rail length can be virtually unlimited). On the carriage is a boom which can be horizontally rotated 360 deg.

The small "truck" which holds the torch can travel 8½ ft on this boom. Truck travel, as well as vertical torch variations of up to 7 ft, can be controlled from a central position.

Raised and lowered electrically, the three-hose mill-type torch can be tilted in relation to the torch truck. Separate mechanical clutches control torch travel parallel to the truck and along the boom.

Only one operator is needed to adjust torch height and travel speed. This man starts and adjusts preheat gases, cutting oxygen, and (when nonferrous metals are encountered) a powder injection.

Fluxing Action

The dispensing unit for powder is carried by the cutting machine carriage. Fed by hose to the cutting torch, the powder causes a fluxing action that helps melt refractory oxides of alloying elements more easily.

Stainless and alloy steels, and scrap containing pockets of slag and refractory materials, are metals on which the powder process is most commonly used.

An example of machine economy cited by Deitch is an application on 20-in.-thick steel scrap. To flame-cut this material, the unit uses 200 cfh of natural gas; preheat oxygen at 400 cfh, and 2,000 cfh of cutting oxygen.

New AMPCO-BRāZ #1 —a "3-in-1" Filler Rod

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Here's a non-fuming, low-melting-point rod that gives you attractive welds with high strength. Ampco-Brāz #1 has a special "controlled" composition that permits both joining and overlay with the oxy-acetylene process.

A wide variety of copper-base, iron- and nickel-base metals and alloys can be joined with this new copper-alloy filler rod. It produces strong, silver-like welds of 85,000 p.s.i. tensile strength with 160,000 p.s.i. shear strength — in bevelled-butt, fillet, and straight-butt joints. There's no warpage or distortion. Ampco-Brāz #1 is excellent for tough overlays, too, because it resists corrosion and wear.

Ampco-Brāz #1 is ideal for all-position welding, and is easy to apply — uses ordinary brazing fluxes and techniques. It goes on rapidly at low cost because a larger flame can be used without "burning" the alloy. A low bonding temperature and low melting point results in smooth, dense, free-flowing deposits.

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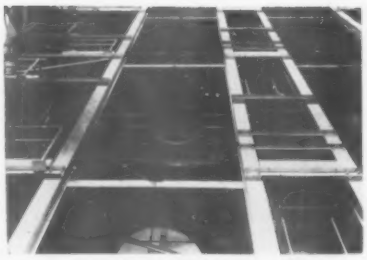

INTERIOR view, looking up, of vertical test and check-out assembly for Vanguard rockets.

Welding the Vanguard rocket

SOMETIME after July 1, scientists will launch the first man-made satellite into an orbit 300 miles above the earth.

The 20-in. spherical satellite, developed by the U. S. Navy for Project Vanguard, is part of U. S. participation in the International Geophysical Year. Prime contractor is The Martin Co.

The Vanguard, first three-stage rocket in the U. S.—and perhaps first in the world—is 72 ft long. The first stage has a 45-in. diameter; the second, a 32-in. diameter.

Welded lightweight metals are used to help the rocket reach its 300-mile goal and a speed of 18,000 mph. If it does not, the 21½-lb satellite will not orbit.

The first stage contains two stressed-skin tanks for liquid fuel and oxidizer, an engine and accessories. Two aluminum skins form tank sides, which are supported by two channel frames and dome-shaped headers. Aluminum extrusions reinforce the joint between skins and headers.

All metal parts are resistance spot and seam welded for leakproof joints. Longitudinal seams were welded at 6 to 8 ipm, and scalloped edges at 2 ipm. Tank headers were manually Tig welded with aluminum welding rod to extruded frames by the scalloped edge. After welding, tanks were pressure-tested and calibrated.

Following launching, the first stage will burn out at a height of 36 miles. The second stage will set the third on course, and this last stage will then boost satellite speed to 18,000 mph and drop away.

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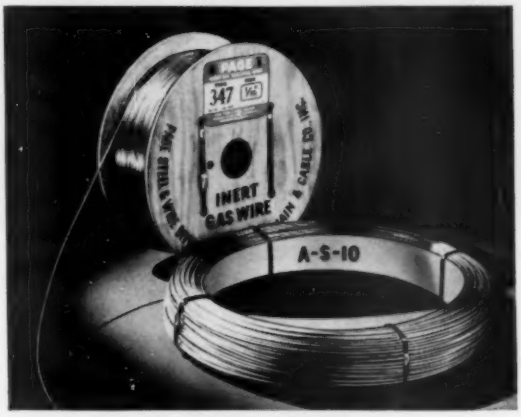

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Pay-off-paks & Leverpaks

PAGE *Pay-off-paks* permit *continuous feeding of wire up to 600 lbs.* (from 20" *Pak*) *or 850 lbs.* (from 23" *Pak*) *without rethreading.* Both *Pay-off-paks* and lightweight *Leverpaks* (*not illustrated*) give protection against distortion and corrosion...are easily opened, resealed, handled, stored. Palletized when requested.

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PAGE automatic arc welding wire and oxy-acetylene welding rods are readily available from PAGE warehouses shown at bottom of this page—and from a nearby PAGE Distributor, wherever you live. Your PAGE Distributor saves you time by filling your needs promptly from his stock. This helps keep your inventory investment down!

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MOREHEAD Medalist L. W. Stettner *(second from left)* is pictured with J. J. Lincoln *(left)*, E. A. Daniels *(second from right)*, and L. L. McBurney.

NEW president of IAA is Eugene Easterly, Linde Air Products Co.

In Minneapolis . . .

Easterly succeeds Pitts as IAA president

By F. T. Tancula

EUGENE Easterly was elected president of the International Acetylene Association at that group's 57th annual convention in Minneapolis last month.

A Linde Air Products Co. vice president, Easterly succeeds C. McL. Pitts, The People's Gas Supply Co., Ltd., Ottawa, who was elected to the board of directors for a three-year term.

Registration for the three-day meeting at the Hotel Nicollet exceeded 300. Local guests swelled the opening day's luncheon attendance to well over 400. Guest speaker was The Honorable George C. Marler, Canada's minister of transport, who described the past, present and future of the St. Lawrence seaway project.

"Friendly Peoples"

Marler depicted the project as "a great contribution to the welfare of both countries, and especially to that area it will serve." He further cited the joint U. S.-Canada effort as "an outstanding example to the world of two friendly peoples and what they can accomplish through cooperation."

Retiring President Pitts earlier had introduced this year's Morehead Medalist, L. W. Stettner of Victor Equipment Co. On the following day, Stettner was honored at a dinner attended by about 200 persons.

Other officers elected for the coming year were H. S. Sutherland of Shawinigan Chemicals Ltd., Montreal, who succeeds Easterly in the vice presidency; H. F. Reinhard, secretary *(re-election)*, and R. J. Niebanck of National Carbide Co., who succeeds Walter Bender of Shawinigan Products Corp. as treasurer.

Rickel Succeeds Lot

Named directors for three years were Pitts, who takes over the seat held by R. B. Swope of Southern Oxygen Co., and C. E. Monlux of Linde Air Products Co. and P. F.

HOSTS at a cocktail party given the first evening of the IAA convention were *(from left)*: L. L. McBurney, president of Smith Welding Equipment Corp., Minneapolis; Mrs. Elmer Smith; Mrs. McBurney, and Elmer Smith, founder and board chairman of Smith Welding.

Acetylene Cylinders...

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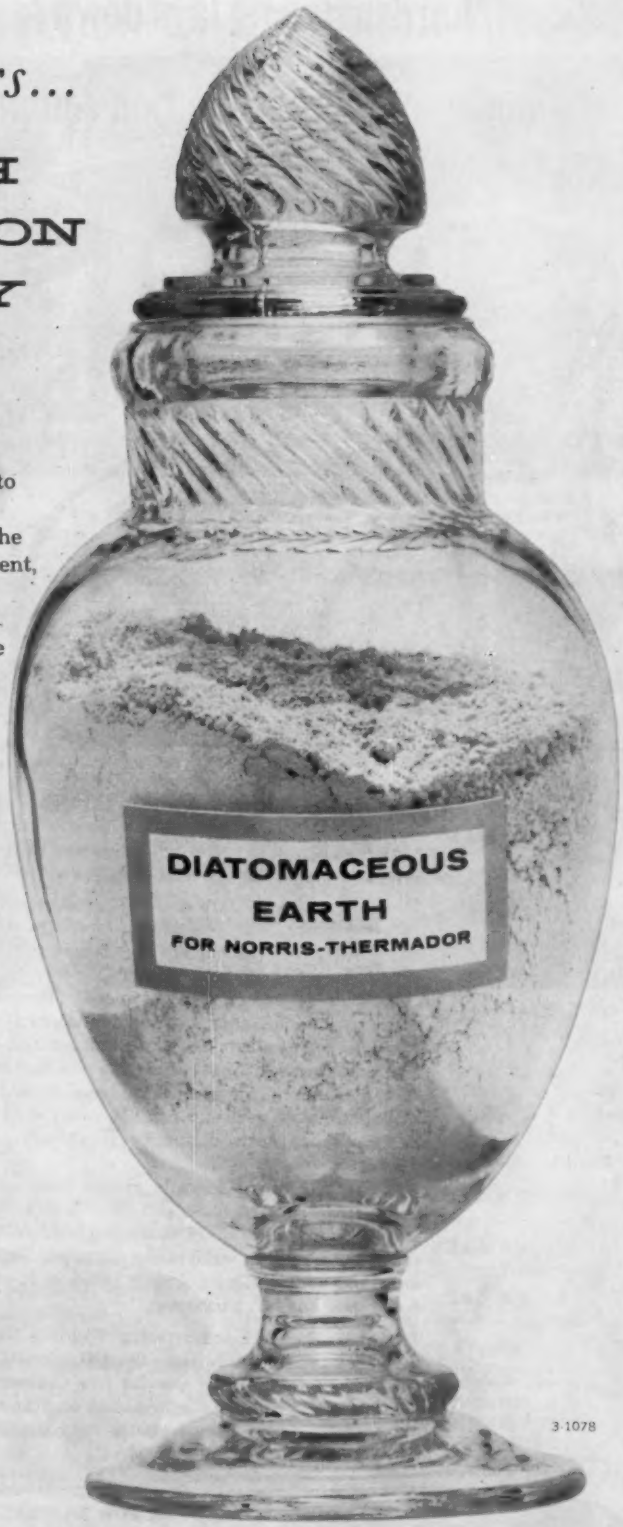
Millions of years ago at the bottom of the ocean! Today – inside Norris-Thermador Acetylene Cylinders!... That's *diatomaceous earth*, containing microscopic diatoms by the billions – selected with exacting care, tested to a precise quality standard, and laboratory-compounded for *prescription accuracy* with the three other filler components – charcoal, cement, asbestos. That's why the filler has higher permeability and lightness... why Norris-Thermador cylinders take gas faster, fill more uniformly, give top performance.

NOTE THESE OTHER FEATURES

Cold-drawn construction... light weight for easy handling... bases curled *under* for maximum strength and compact storage... larger cap holes... tags easily read without having to remove them... all welding X-ray controlled... specifications ICC-8 met and exceeded.

Acetylene Cylinders from 10 to 300 cubic feet capacity. Write or wire for specifications on all sizes. Cable Northerm.



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Ranite hardsurfacing lays down faster... lasts longer on all construction equipment!

Periodical Ranite hardsurfacing of crusher rolls, mill hammers . . . scraper blades, and all areas that wear out fast insures *longer equipment life . . . saves replacement costs . . . cuts down time.*

Ranite's fast deposition rate and greater metal recovery means that wearing surfaces are built up faster with less hardsurfacing material, in less down time.

You can depend on Ranite's speed . . . Ranite's economy because they are formula-controlled. Pure powdered alloys and the exact amount of flux necessary for instantaneous fusion have been combined for a perfect, balanced formula. This permits 80 per cent metal recovery during hardsurfacing for maximum metal recovery per pound.

Ranite's balanced formula makes possible a deposition rate 20 to 25 per cent faster. It's smoother, too, right down to the butt end. With easy-to-use Ranite, welders can lay down more metal per hour uniformly in any position. It will not chip . . . spall . . . mushroom.

There's a Ranite Hardsurfacing Welding Rod for every type application—from Rockwell C hardness 25 to 68. Send now for free Comparison Chart and complete information on Ranite. Field engineers are also available for consultation on any hardsurfacing problem.

Ranite HARDSURFACING WELDING MATERIALS

ASK YOUR DISTRIBUTOR FOR RANITE!

RANKIN MANUFACTURING CO.

616 S. Marengo Ave., Alhambra, California

TOUCH of glamor at opening luncheon was added by Princess Kay of the Milky Way, Minnesota dairy queen.

Lavedan of The Liquid Carbonic Corp. Monlux and Lavedan were re-elected.

Another director had to be named to fill the unexpired term of Andre Lot of Canadian Liquid Air Co., who resigned because he is returning to France. To succeed him for the remaining two years, the convention chose C. A. Rickel of Big 3 Welding Supply Co.

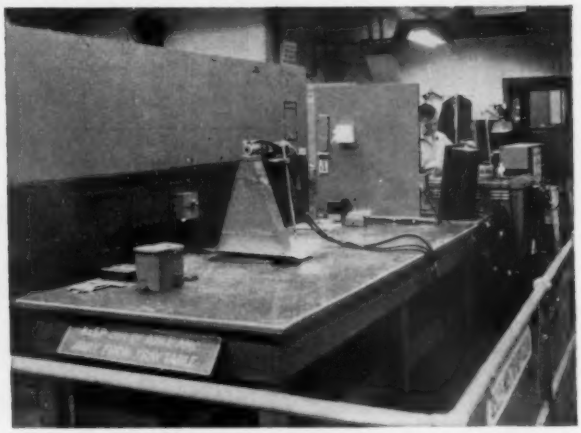
During the business session, members also voted to revise the by-laws of the association. These revisions are the first since 1943. Chief among the amendments was the increase in membership dues. All classes were raised 50% except the individual membership (Class D) which was hiked 40%.

Nine technical papers were presented during the meeting. On Tuesday afternoon (April 2), a five-man panel discussed the roles educators and industry are filling in better preparing the student for life in the industrial world.

ON their way to luncheon are C. McL. Pitts *(left)*, retiring IAA president, and Hon. George C. Marler, guest speaker at luncheon.

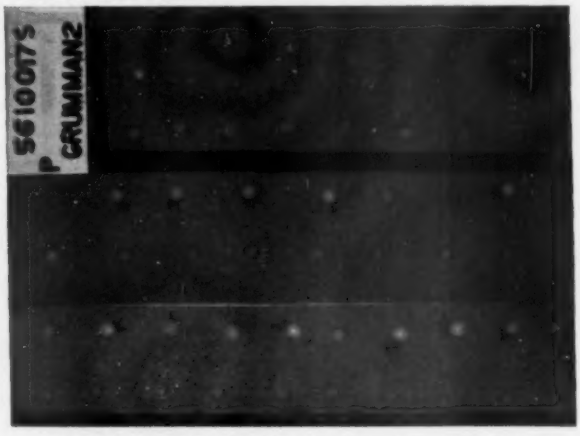
One Minute X-ray Inspection at Grumman Aircraft

X-RAY WITHOUT DELAY This is one of three radiographic stations in the Grumman Bethpage plant where production spotwelds are inspected. Finished sections flow to it as they are completed.



QUICK, SAFE SETUP The radiographer lays the section on a loaded Picker-Polaroid cassette, positions the x-ray tube over it. On completing the setup he steps behind the lead screen and makes the 15 second exposure.

FINISHED IN ONE MINUTE He drops the exposed cassette into the Picker-Polaroid processor, snaps the cover down. One minute later out comes the fully developed x-ray.



NO DARK ROOM, NO SOLUTIONS Here's how the resultant Picker-Polaroid radiograph looks—a glossy dry 10" x 12" picture, easily read in ordinary light without using an Illuminator.

Aircraft spotwelds have to be sound . . . or else. To keep them so, Grumman Aircraft radiographs spotwelded body sections right on the production line without interrupting work flow. A Picker 50 KV x-ray unit does the job (see it there behind the lead screen . . . no bigger than a filing cabinet. The x-ray tube comes out on extension lines for remote work like this). 15 seconds for the x-ray exposure; one minute for processing . . . so it goes day in and day out, standing vigilant watch over Grumman's high quality standards.

If you, too, need to spot hidden defects to keep a firm finger on quality control, we'll be glad to tell you what this unique unit (or others in the broad Picker x-ray and gamma line) can do for you.*

*There's probably a Picker District office near you (see local 'phone book). Or write Picker X-Ray Corporation, 25 South Broadway, White Plains, New York.

some other Picker units . . .

150 KV
up to 1" steel, 5½" aluminum

270 KV
lightweight, portable

260 KV
for heavy duty inspection

GAMMA
Technical Operations
sources, equipment, containers

INSPECTION CABINETS
eliminate lead-lined rooms

ACCESSORIES
films, cassettes, tanks, chemicals, darkroom sundries . . . everything

if it has to do with radiography it has to do with **Picker x-ray**

PREFABRICATED home features strength of lightweight steel in roof trusses and steel-framed welded panels. This 28 by 44 ft model has 5/12 pitched roof and 4-ft offset in bedroom wing for more space.

U. S. Steel presents a welded prefab home

By Audrey L. Madsen

ANOTHER STEP in the trend toward prefabricated homes is the new steel house of U. S. Steel Corp. And welded steel panels, 4 ft by 8 ft, form the basic structure of the packaged "Steelaire."

Introduced at a National Association of Home Builders convention in Chicago, the new house can reportedly be assembled in one working day by a crew of 7 or 8 men.

It was developed after 6 years of research to fill a continuing need for a moderate-cost home.

Panel Frames

Prefabricated on the production line at the Harrisburg, Pa., plant of USS, the "Steelaire" employs modular construction. Major prefab components—panels forming exterior and interior walls, and roof trusses —are field assembled.

Panel frames are cold-rolled copper-steel channels bonderized and painted. Plywood sheathing is attached to the exterior side and ½ in. gypsum board to the interior. Paint, wallpaper or any rough finish may be used.

Roof trusses are cold-rolled formed steel sections, bolted together at the homesite. The roof provides a 28-ft clear span truss. Interior partitions are non-load-bearing.

Steel is used in gable ends, gutterboard, rake fascia, eave and rake soffits. Windows, doors and cabinets are also steel.

A special production set-up has been installed at the Harrisburg plant. There are 8 jigs for the fabrication of the basic component—the 4 by 8 ft panel.

Spot Welded

Welding equipment consists of a series of adjustable slide beam tables with air-operated toggle clamps for positioning and holding. Resistance spot welding guns with special adapters are used for welding. They are progressive, portable hydraulically-operated scissors type.

Welding units are suspended from a monorail to facilitate lateral movement. Swivel hooks under the trolley permit 360-deg rotation.

Welding sequence for the resistance application is: squeeze time, 40 cycles; weld time, 30 cycles; hold time, 15 cycles.

Electrodes required are flat, dome, pointed and offset types, depending upon weld location. The window panel frame is the most complicated unit to be welded.

In fabricating a typical panel, parts are die-formed on a continuous roll-form line. They are then welded, cleaned and bonderized, painted and baked.

Semi-Rigid Frame

Wall unit framing consists of two vertical 11-gage channel sections with flanges pointing outward. These sections are spaced by similarly-placed horizontal members and welded to form a semi-rigid frame. Holes are formed in flanges for fastening covering material.

Interior partition units, 8 ft high and in various widths, consist of wall and door units. The channel-section window frame is welded to the window unit frame. The channel-section door frame (a header, two jambs and jamb spacers) is also welded to the unit frame.

Truss units are shop fabricated and assembled in the field. The welded eave connector is composed of two 14-gage U-shaped sections, 10 in. long and 1½ in. deep, with a 1-in. outward flange on each side.

The house is pre-finished as far as possible in the factory. Allowance is made, of course, for the foundation. Special provision is made in concrete slab-on-ground construction for placing ½ in. anchor bolts that hold exterior walls. Walls themselves are fastened by bolting or nailing. Bottoms are secured by bolts, nails or studs, depending on the foundation.

There are 3 types of homes available at present. Initially, distribution will be limited to a 350-mile radius around Harrisburg. But USS has high hopes for the future.

Weldor joins steel upright to bottom panel of grinder pedestal. He gets stable arc, smooth bead contour, sound deposits with Ni-Rod electrodes.

Produce cast iron assemblies easily! ...with Ni-Rod electrodes

This weldor is completing fabrication of a grinder pedestal—profitable product of a Canadian foundry.

The design calls for joining the 1-inch steel-pipe uprights to the cast iron members. With easy-handling Ni-Rod* electrode, it's a *quick* job!

For the manufacturer, it's a money-saving job—far less costly than assembling the pedestal by machining and bolting.

Many shops save time, reduce production costs, with Ni-Rod—the electrode with the nickel core wire and special flux. Even weldors of limited experience get good results. Strong, smooth welds. Machinability that is important in production work.

Another big advantage: preheat or post-heat is seldom needed with Ni-Rod electrodes. And weld metal matches the color of the cast irons.

Produce or repair cast iron equipment with Ni-Rod and Ni-Rod "55"* electrodes—and save money as many fabricators do. Send for Inco's illustrated "Handy Guide to Welding Cast Irons." It contains informative stories of successful welding... technical data...tips on production work, emergency repairs, and more. Address a postcard to:

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67 Wall Street New York 5, N. Y.
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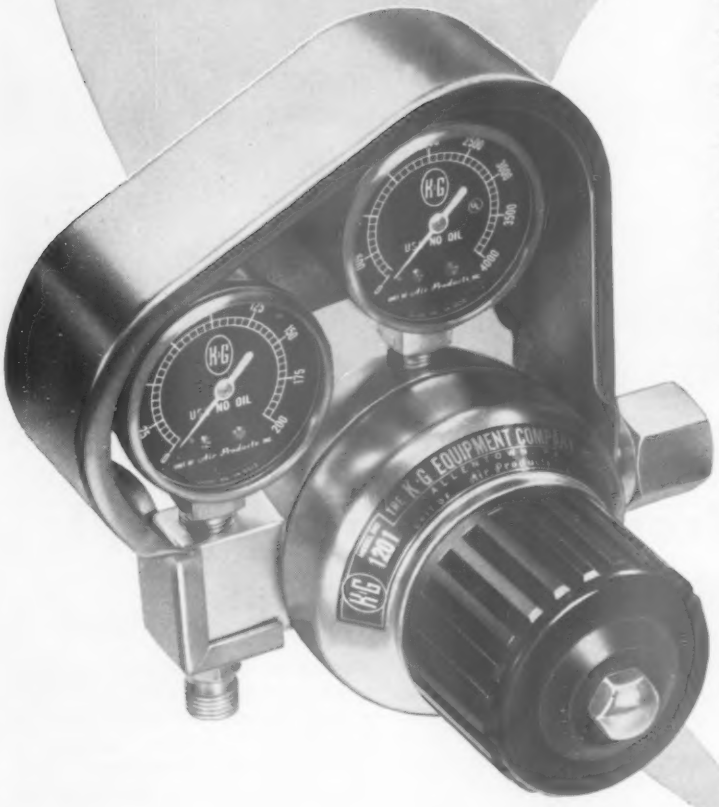
ON GUARD design... safety plus, and sure to save you money



ENGINEERED for safety and built to take a beating . . . when you use the ON GUARD regulator, you're rid of costly repairs.

ON GUARD protects gages from damage. Adjusting mechanism is completely enclosed inside bonnet. Working parts are stainless steel. Aluminum alloy forgings add strength without weight. ON GUARD is economical . . . rugged . . . your best bet for top-performance service.

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How to estimate electrode consumption

ALL 90° WELDS

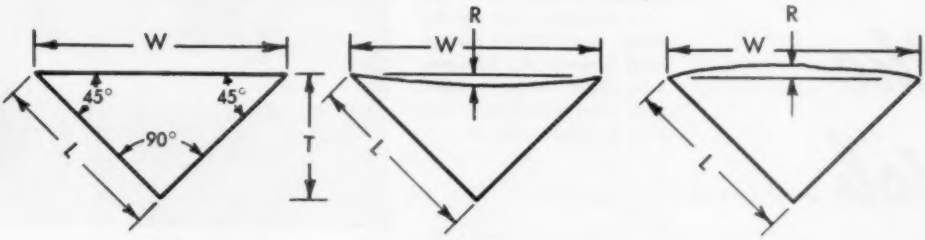


Fig. 1 Fig. 2 Fig. 3

T	L	W	R	Weight of Electrode per linear foot in Lbs. for Figure 1		Weight of Electrode per linear foot in Lbs. for Figure 2		Weight of Electrode per linear foot in Lbs. for Figure 3	
				Bare	Coated	Bare	Coated	Bare	Coated
	1/8	0.177	0.018	0.03	0.04	0.02	0.03	0.04	0.05
	5/32	0.22	0.022	0.05	0.06	0.03	0.04	0.07	0.09
1/8	.18	1/4	0.025	0.06	0.08	0.04	0.05	0.08	0.11
	3/16	0.27	0.027	0.07	0.09	0.04	0.06	0.08	0.13
5/32	.22	5/16	0.031	0.09	0.13	0.06	0.08	0.13	0.18
	1/4	0.35	0.035	0.12	0.16	0.07	0.10	0.17	0.23
3/16	.27	3/8	0.037	0.13	0.18	0.08	0.10	0.19	0.25
	5/16	0.44	0.044	0.19	0.25	0.11	0.15	0.27	0.36
1/4	.35	1/2	0.050	0.24	0.33	0.15	0.20	0.34	0.46
	3/8	0.53	0.053	0.27	0.37	0.16	0.22	0.38	0.51
5/16	.44	5/8	0.063	0.38	0.51	0.23	0.31	0.53	0.71
	1/2	0.71	0.063	0.49	0.65	0.32	0.43	0.66	0.89
3/8	.53	3/4	0.063	0.55	0.73	0.36	0.49	0.73	0.98
	5/8	0.88	0.063	0.76	1.02	0.54	0.73	0.97	1.30
1/2	.71	1	0.063	0.97	1.30	0.73	0.98	1.22	1.63
	3/4	1.06	0.063	1.09	1.46	0.84	1.12	1.35	1.81
5/8	.88	1 1/4	0.063	1.52	2.03	1.22	1.63	1.82	2.44
	1	1.41	0.063	1.94	2.06	1.60	2.14	2.29	3.06
3/4	1.060	1 1/2	0.063	2.19	2.93	1.82	2.44	2.55	3.42
	1 1/4	1.77	0.063	3.04	4.07	2.61	3.49	3.47	4.64
1	1.41	2	0.063	3.89	5.21	3.40	4.56	4.38	5.86
	1 1/2	2.12	0.063	4.38	5.86	3.86	5.17	4.89	6.55
	1 3/4	2.48	0.063	5.96	7.97	5.35	7.17	6.56	8.78
1 1/4	1.77	2 1/2	0.063	6.08	8.13	5.47	7.32	6.69	8.95
	2	2.83	0.063	7.78	10.41	7.09	9.49	8.47	11.33
1 1/2	2.12	3	0.063	8.75	11.71	8.02	10.74	9.48	12.69
	2 1/4	3.18	0.063	9.85	13.18	9.07	12.14	10.62	14.21
1 3/4	2.47	3 1/2	0.063	11.86	15.94	11.06	14.80	12.76	17.08
	2 1/2	3.54	0.063	12.16	16.27	11.30	15.12	13.01	17.42
	2 3/4	3.89	0.063	14.71	19.68	13.76	18.42	15.65	20.95
2	2.83	4	0.063	15.56	20.82	14.59	19.52	16.53	22.13
	3	4.24	0.063	17.50	23.43	16.47	22.05	18.53	24.81
2 1/4	3.18	4 1/2	0.063	19.69	26.36	18.60	24.89	20.79	27.82
2 1/2	3.54	5	0.063	24.31	32.54	23.09	30.91	25.53	34.17
2 3/4	3.89	5 1/2	0.063	29.42	39.37	28.08	37.58	30.75	41.16
3	4.24	6	0.063	35.01	46.86	33.55	44.90	36.47	48.81

For further data on this subject, see Engineering Data Sheet No. 199, WELDING ENGINEER, *April, 1957, pp. 78, 79.*

—Courtesy National Cylinder Gas Co.

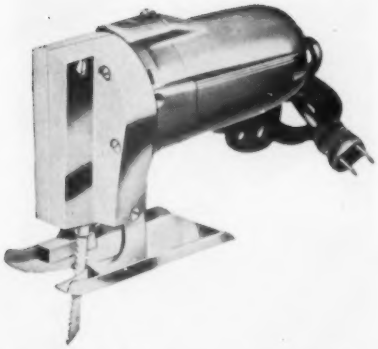
On the job...

WHEN the crane-carrying truck of Carter Bros. Ltd., Waterloo, Ontario, comes down the road, its front end is bending low . . . a condition attributable to a welded, triple-purpose bumper. Serving as bumper and grille guard, and as a counterweight for the crane, this 2,000-lb component is made of 12-in. and 3-in. pipe sections filled with steel punchings, cast iron turnings and oil.

SPECIAL spot welder can be adjusted for 3,200 independent settings, and with head pressure of 4,000 lb, unit can weld any existing "superalloy." Manufactured by Sciaky Bros., Inc., for Finn Aeronautical Div., Hawthorne, N. J., spot welder is currently joining fuel systems, exhaust nozzles and other components of jet, ram jet and rocket-propulsion engines.

RIGHT: Compressor perched 20 ft above work area of High Welding Co., Lancaster, Pa., supplies 25 cfm of compressed air for grinders and chipping hammers. The 25-hp, vibration-free unit, manufactured by Schramm, Inc., West Chester, Pa., is mounted on brackets welded to a roof-support column. High Welding estimates 20 sq ft of floor space was saved by elevation.

MIG welding unit manufactured by General Electric Co. is used to join aluminum tanks at Heil Co., Milwaukee. Metal cart carries argon shielding gas, plus water-cooling and wire-drive units, in a 50-ft radius of generator. Type 5154 aluminum, 0.156 in. thick, is used in round or elliptical shells for these transport tanks. Capacities range from 3,000 to 9,000 gal, and finished tanks must provide 34,000 psi tensile strength. (*See* "Stainless & plastics combine to make a tough tank," *Welding Engineer, Apr., p. 58.*)



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Joint area is hand-fluxed with HANDY FLUX after which ½" piece of 1/16" EASY-FLO 45 wire is placed on top of joint area. Alloy cost is one half cent per joint.

Assemblies are placed between resistance-heating electrodes which serve also as a jig. Operator applies current with foot pedal. Melted EASY-FLO 45 penetrates joint area quickly and easily. Assemblies are then given rapid quench to preserve hardness of cross-slide and to remove HANDY FLUX easily. Time required for complete cycle: 22 seconds. This lady brazes from 1200 to 1500 assemblies per day.

GET THE FACTS OF EASY-FLO

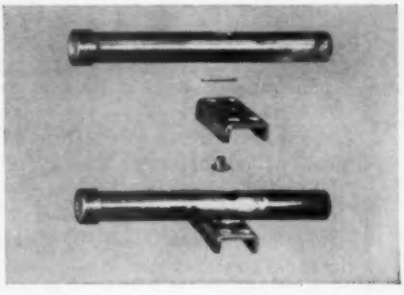
BULLETIN 20 tells you why high strength, speed and economy are inherent in EASY-FLO brazing. Also gives Handy information about joint design and fast brazing methods. We'll be pleased to send you a copy.

EASY-FLO 45 Solves Problems of Strain and Abuse

In this case, the strain and abuse are centered on the cross-slide joint of a bayonet power saw drive shaft. Made by Wen Products, Inc., Chicago, Illinois, for the do-it-yourselfer as well as the professional, this powerful tool operates at 2650 load strokes per minute and is expected to stand up to considerable strain and abuse throughout its lifetime.

The problem to be permanently solved was that of joining the steel cross-slide piece (.005 case hardened) to the drive shaft. The solution . . . silver brazing with EASY-FLO 45. A simple silver brazed joint assures all the strength this part will ever need. And the people at Wen Products were sure of it when they tested the part in this manner: After brazing, it was placed in a vise and the cross-slide piece was struck at right angles with a hammer. It was completely mangled before it was torn from the shaft. Thousands of these saws are in use today and there is no record of this joint *ever having tailed* in service. That says a lot for silver alloy brazing... with EASY-FLO 45.

One of the beauties of silver alloy brazing is that it can join a wide variety of metals with the same excellent results and at remarkably low cost. Whatever you are making of metal, whether joints are involved *or not*, it will pay you to investigate EASY-FLO brazing. We will be glad to explain the benefits of simplified design made possible by modern silver brazing techniques —and how these advantages can be profitably applied to your production requirements. Just call us.



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MIG and Tig welding joined 40-ft lengths of aluminum pipe for installation at Point Comfort, Tex. Pipeline is longest unprotected aluminum gas transmission line now in service.

Mig and Tig weld aluminum pipe

A MAJOR aluminum, gas-carrying pipeline installation that resists corrosion without external protection was completed recently with the help of both Mig and Tig welding methods.

It was installed by Lavaca Pipe Line Co. as part of the gas transportation system servicing Alcoa's Point Comfort (Tex.) operations.

The pipeline, 8 in. in diameter and 20,000 ft long, ranks as the longest unprotected aluminum gas transmission line now in service.

Installation of the line involved joining 40-ft lengths by the Tig (tungsten inert-gas) and Mig (metal inert-gas) welding processes.

Bursting Pressure

To help meet mounting fuel needs generated by an expansion program at the Point Comfort works, gas flows through the new line at a pressure just under 500 psi.

The pipeline has been tested at 800 psi, and has a calculated bursting pressure of 1,500 psi. Steel pipelines of 8-in. diameter are frequently operated at pressures of approximately 800 psi.

Extending through nearly 4 miles of rural area, the schedule 40 pipe is buried in soil ranging from sand and mud to brackish marsh. Completely devoid of protective coatings and anodes, the aluminum line is shielded only by electrical insulation at certain flanged joints. Anodes will be installed on test sections, however, to measure their effectiveness.

Low-Cost Service

Steel pipe buried under similar conditions would be *doped* and swathed in a protective wrapping to guard against corrosion. Cathodic protection has recently been suggested as an additional barrier against external corrosion of steel pipe.

Alcoa, the pipe manufacturer, hopes corrosion resistance of aluminum pipe will result in long, efficient, low-cost service. Pipeline performance in this test may determine the light metal's suitability for further use in the oil country.

The American Petroleum Institute is currently considering specifications for aluminum pipeline.

EXTENDING through nearly 4 miles of rural Texas area, schedule 40 aluminum pipe was buried without protective coating and has only a few test anodes. Pipe is laid in both sandy and marshy ground.

In a board walk the largest item of expense is the lumber; in a splendid violin the least item of expense is the lumber.

In a plain wall the stone is the chief cost; in a piece of classic statuary the cost of the stone is hardly reckoned.

This principle, in a certain degree, applies to the making of a good positioner. We do not pretend that we put more or less material into each Aronson Positioner; but we do put in the best materials, the scientific knowledge and expert skill and the long-continued care which no ordinary positioner contains.

If you want to get rich music or a treasure of the sculptor's art or a job of positioning that will be satisfactory and increase your profits, you must pay for something other than raw material.

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POWDER
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MILD STEEL, LOW HYDROGEN AND HARD-FACING
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National-U.S. Radiator Corporation

HOTEL Mayflower, handsome headquarters for the 13th annual convention of the National Welding Supply Association in Washington, D. C.

NWSA picks a capital convention site

THE NATION'S capital, that is—Washington, D. C., headquarters for the 13th annual convention of the National Welding Supply Association.

Meeting for four days, May 13 to 16, NWSA members and guests will register at the Hotel Mayflower for a round of formal addresses, business sessions and receptions.

The convention's first day, Monday, May 13, will be devoted largely to registration. NWSA officers and directors will meet at 9 a.m. Sales meetings and sightseeing tours will occupy other registrants until the president's reception at 6 p.m. in the hotel ballroom.

Senator Speaks

Formal convention affairs come under discussion at the opening general business session on Tuesday, May 14. R. C. Fernley, executive secretary of NWSA, will report activities through the 1956-57 year, and Association President C. O. Stilwell, whose term expires at this meeting, will then present the president's address.

Senator William A. Purtell (R., Conn.) has been asked this year to present the convention's keynote address. Senator Purtell is a former director of the U. S. Chamber of Commerce.

R. P. Tarbell, chairman of NWSA's Industry Relations and Publicity Committee, will report to members following the keynote address. Closing the morning session will be George P. Lamb of Cann, Taylor, Lamb and Long, speaking on "Trade association membership—a responsibility."

Following a noon luncheon, members will engage in a popular annual event—the contact booth program. This period of informal meetings and discussions is scheduled also for Wednesday afternoon.

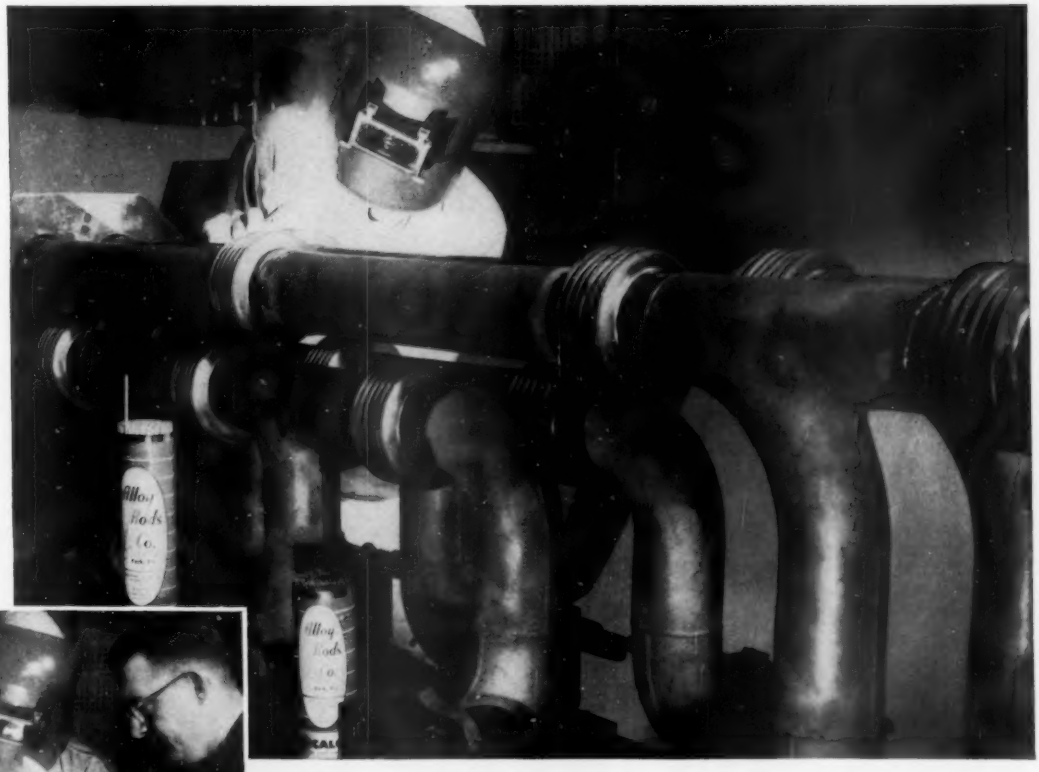
Panel Discussion

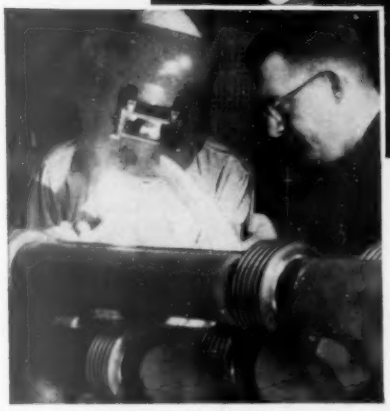
Highlights of Wednesday's business session include a talk by the president and publisher of *The Dothan* (Ala.) *Eagle*, Ralph Nicholson, on "Getting along with people," and a panel discussion by NWSA members on such topics as finance, personnel, operations and sales. V. B. Anderson, O. C. Mills, R. Toll and E. A. Daniels will participate.

The hotel's ballroom will be the scene, Wednesday night, of a formal reception and the Association's annual banquet and dance.

A final business session is scheduled for Thursday morning, and speakers will be Ernest Clevenger and Arch N. Booth. Mr. Clevenger is vice president of Corley Mfg. Co., Chattanooga. "People, products and progress: 1975" will be the topic discussed by Mr. Booth, executive vice president of the U. S. Chamber of Commerce.

Chairman of the 1957 Convention Committee is A. C. Earlbeck, who has announced a social program for those ladies who accompany their husbands to the convention. Included in this program are luncheons and a tour of the Washington-Virginia area.





Phil Hoener looks on as the weldor joins a bellows to the type 321 stainless manifold with Arcaloy type 347 electrodes

For maximum corrosion resistance at elevated temperatures . . .

HANLON & WILSON CO. selected

ARCALOY

STAINLESS STEEL ELECTRODES

Highly corrosive diesel fumes at temperatures up to 1300° F. is the reason why Philip Hoener, Shop Superintendent, specified Arcaloy 347 AC-DC electrodes for the welds in this new stainless steel manifold for diesel engines.

Hanlon & Wilson Company, Pittsburgh, Pa., are the developers and manufacturers of this revolutionary, exceedingly superior manifold design which more than doubles the service cycle of railroad diesel engines.

The key to this development is a series of stainless steel bellows of unique design. Fourteen of these bellows working on a horizontal sleeve arrangement have eliminated failures caused by expansion and contraction, vibration, gas pressures and of course, corrosion.

There are 25 grades of Arcaloy stainless steel electrodes, in lime or AC-DC coatings, that will improve your product . . . provide a better quality weld metal. Write for a copy of bulletin AR-10, the selector guide to superior quality stainless steel weld metal.

Alloy Rods Co.

General Offices and Plant
Lincoln Highway West
YORK 2, PENNSYLVANIA

Pacific Coast Sales Office and Plant
750 Lairport Street
EL SEGUNDO, CALIF.

NO FINER ELECTRODES MADE . . . ANYWHERE

new products . . . . . USE CARD ON PAGE 123

TILTING turning roll, model "WRUPT30" illustrated (30,000 lb capacity), has protractor for tilt degree and large rubber-tired wheels for diameter setting variety.

X-RAY inspection is made easy by new portable running gear. Unit features vertical movement up and down and circumferential movement. In addition, the gear will accommodate several models of X-ray units. Construction is sturdy with rubber tires.

Turning roll

TILTING turning roll is universal in job applications-can be used as plain turning roll for work to 20 ft long and from 4 in. to 6 ft diameter. End stops can be adjusted for 20 to 13 ft lengths. Available in 5,000-30,000-lb capacities, all models have protractor to indicate tilt degree. *Aronson Machine Co.*

Circle No. 1.

Anti-spatter

MIG nozzle compound "65", containing silicone, is said to eliminate work stoppage caused by spatter-encrusted welding nozzles. Applied to nozzle before Mig welding, compound forms thin protective coating over bore and mouth, preventing molten spatter from sticking. Under normal conditions, coating gives 8-hour protection. Compound, supplied in 4-oz can with spout, is applied directly to nozzle. *Linde Air Products Co.*

Circle No. 2.

Fluxless solder

FLUXLESS aluminum solder was developed for soldering mitered joints without flux. Characteristics of "55 Rubbon" include: strength to 20,000 psi in mitered joint; lead free; no galvanic action between solder and base metal; good color match with aluminum. Solder can be applied with any heat that will raise temperature to 720 F, at which point alloy flows freely.

Best bond is obtained by heating cleaned base metal so that solder melts when rubbed on the surface. This tins the surface. Joining is done by heating two tinned surfaces held firmly together. Solder can be used with copper and steel also. *All-State Welding Alloys Co., Inc.*

Circle No. 3.

Hardfacer

AUTOMATIC "Optiflame Model D" is an oxyacetylene hardfacing machine. Speed is reported 5 to 8 times faster than manual hardfacing. Water-cooled torch provides controlled preheat, weld heat and post heat. Coiled rod is fed at positive pressure against work. Positioner gives adjustment; magnetic face plate, special jigs available. *L&B Welding Equipment, Inc.*

Circle No. 4.

Portable X-ray

LATEST development in "Fedrex" X-ray equipment is portable running gear. Portable unit is flexible with vertical movement (up and down) and circumferential movement of 225 deg. Unit can carry models "120," "160," "200" and "260." Shown mounted is model "260" portable X-ray unit. *Machinery & Welder Corp.*

Circle No. 5.

Weldor's c-clamp

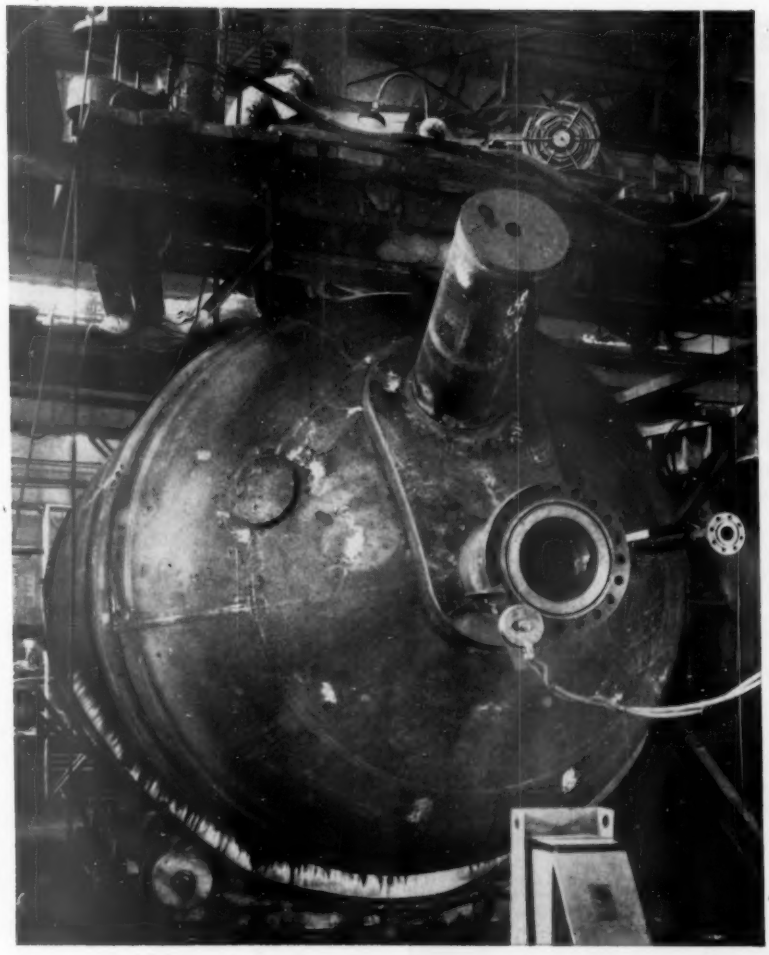
LATEST feature of the "Grand Clampmaster" c-clamp is a ratchet screw to position clamp screw and release it with trigger action. Clamp has throat depth to 6 in. Available is complete line of weldor's clamps with single and dual grips. *Grand Specialties Co.*

Circle No. 6.

Abrasive service

FREE engineering service — "Maximum Automation Potential or "M-A-P" — is new method, devised exclusively by this firm, to predict performance of abrasive belts on metal removal operations (except snagging). Studies are made away from the customer's plant. Abrasive belt recommendation is made based on basic production facts supplied by the customer. Performance predictions, reports the firm, are proving better than 90% accurate. *The Carborundum Co.*

Circle No. 7.



When fabrication codes demand 100% X-ray inspection...

SPECIFY *Drawalloy* CORPORATION

Stainless Steel Welding Wire

In hundreds of applications, *Drawalloy* wire has been put to the test . . . X-ray, dye check, pressure and service and with the same consistent result—OK as welded. That's why Frank Iapalucci, Manager of Welding Engineering for Baldwin Lima Hamilton, Eddystone, Penna., selected *Drawalloy* chrome-moly wire for the automatic welds on this reactor. The vessel is constructed of A 301-54T Grade B firebox quality steel ranging in thickness from 5-1/16" to 2-5/8". *Drawalloy* 1-1/4 Cr, 1/2 Mo wire was used for all submerged arc joints.

When inspection by X-ray is required, don't gamble . . . rewelding is expensive . . . specify Drawalloy "quality controlled" wire. *Drawalloy* stainless steel welding wire is produced to strictly controlled specifications to provide the right chemistry, finish and temper for smooth operation in your equipment and to provide X-ray quality welds.

Why not discuss your stainless welding wire needs with your *Drawalloy* Distributor or Representative . . . a man ready to help you. Bulletin 355-DC provides complete information on every grade of *Drawalloy* wire. Write to: Drawalloy Corporation, Lincoln Highway West at Alloy Street, York 12, Pennsylvania.

DRAWALLOY
CORPORATION
YORK, PENNSYLVANIA

THE WIRE MILL FOR THE WELDING INDUSTRY — STAINLESS STEEL · HARD SURFACING · TOOL STEEL

Welding Electrode Production Equipment

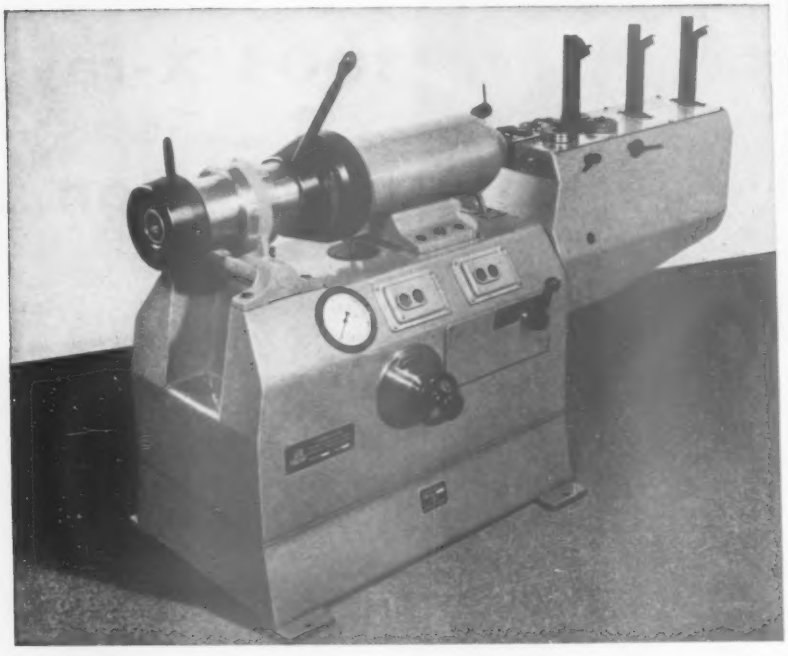
OERLIKON

Developed by the electrode manufacturer—

Built by machine tool makers—

For electrode manufacturers

Automatic batching plants, Mixing equipment, 10 t and 40 t hydraulic Slug Presses, 25 t, 85 t and 200 t hydraulic Extruders, High-Speed automatic Wire Feeders, Brushing Machines, Concentricity and Moisture Testers, Stationary and Continuous Drying Ovens, Laboratory Equipment.



One example out of our production programme:
OERLIKON EP 12 EXPERIMENTAL EXTRUDER
Wire speed 15-105 ft.—min. Rod length 8-20 in.
Wire gauges 1/32-13/32 in. Flux volume 27 cu. in.

For detailed information please write to:

OERLIKON MACHINE TOOL WORKS
BUEHRLE & CO.

Welding Electrode Division

Zürich-Oerlikon, Birchstrasse 230, Switzerland

LOW-COST and portability are features of "Baltospot 200" X-ray unit for radiographic inspection. Rated capacity is 200,000 volts. Shockproof X-ray head weighs 85 lb. Unit will radiograph thin magnesium sheet to 3-in. steel. *Balteau Electric Corp.*
Circle No. 8.

Solder flux

NEW soldering flux "Amco 261" is active at low temperatures. Free of chlorides and resin compounds, the new flux, when used with conventional solders, begins cleaning action at 150 F and continues to melting point of regular solder. This new paste flux is noncorrosive. *American Solder & Flux Co.*
Circle No. 9.

Safety spectacle

EYE safety and comfort typify the new square-shape "S-7" safety spectacle. Plastic safety frames in bronze or crystal pinks are lightweight. Safety lenses in light plastic or hardened plain or prescription glass are available. *U. S. Safety Service Co.*
Circle No. 10.

Helmet window

WELDORS who wear bifocal glasses will be helped by new optical accessory for helmet windows—the "Magna-Weld" plate. It fits behind regular helmet filter lens to provide magnification for near vision *throughout* entire window area.

Plate is made of optical glass, mounted in rugged frame. Eight focal powers and special lenses are available. *Sellstrom Mfg. Co.*
Circle No. 11.

choose CRUCIBLE STAINLESS

AUTOMATIC WELDING WIRE

for

1. widest range of analyses
2. fast delivery from local stocks
3. packaging to fit your needs
4. Crucible special steel quality

Crucible stainless automatic welding wire gives faster, cleaner, sounder welds – saves you time and money. And it's backed by a half century of *special steelmaking.*

At your local Crucible warehouse, automatic welding wire is promptly available in most stainless steel grades . . . in spools, coils or cut lengths to fit your exact requirements.

So next time you need welding wire – or help with a welding problem – call Crucible. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

Canadian Distributor — Railway & Power Engineering Corp., Ltd.

GB 88 FLUX .. *available in 3 oz., ½ lb., 1 lb., 5 lb. jars and 25 lb. drums to suit your needs*

Use GB 88 Flux, the flux of proven dependability and note the improvement in the quality of your Silver Brazing. GB 88 is fully active to 1650°F.

Low glare and low fuming characteristics insure operator comfort and quality results. It is stable in use as well as in storage and was developed for Silver Brazing of STEEL, BRASS, COPPER, STAINLESS STEEL, MONEL, NICKEL, INCONEL, CHROME ALLOYS, SILVER and GOLD.

For best results team up GB 88 Flux with GB Silver Brazing Alloy in the form or size you require: random coils (all diameters), strip, straight lengths, pre-formed rings and special shapes. Prompt service on all inquiries.

1857 1953 90th ANNIVERSARY

Goldsmith Bros.
SMELTING & REFINING CO.

111 N. Wabash Ave., Chicago 2, Ill. • 74 W. 46th St., New York 36, N. Y.
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Mail Coupon for your FREE copy of the GB Data Book—complete information on low temperature Silver Brazing

PLEASE SEND GB Data Book without obligation.

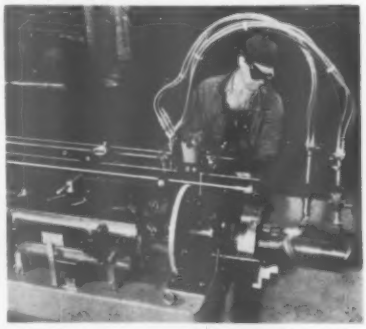
Name_____

Address_____

City_____ State_____

Pipe cutter

FLAME-cutting machine automatically generates, cuts, bevels and contours pipe joints without cams, patterns or templates. The "Mechanical Draftsman" requires only three settings, on easily adjusted scales, to conform to



PIPE-cutting machine automatically cuts, bevels and contours pipe without patterns or templates. Shown in operation, torches can be used simultaneously for opposing saddles. Automatic torch ignition and oxygen flow control switches are also shown.

ID of pipe being cut, OD of pipe being intersected and angle of intersection. Fourth adjustment is provided for pipe intersections with offset center lines. Two models handle pipe diameters to 24 in. in any wall thickness. *Steffan Engineering.*

Circle No. 12.

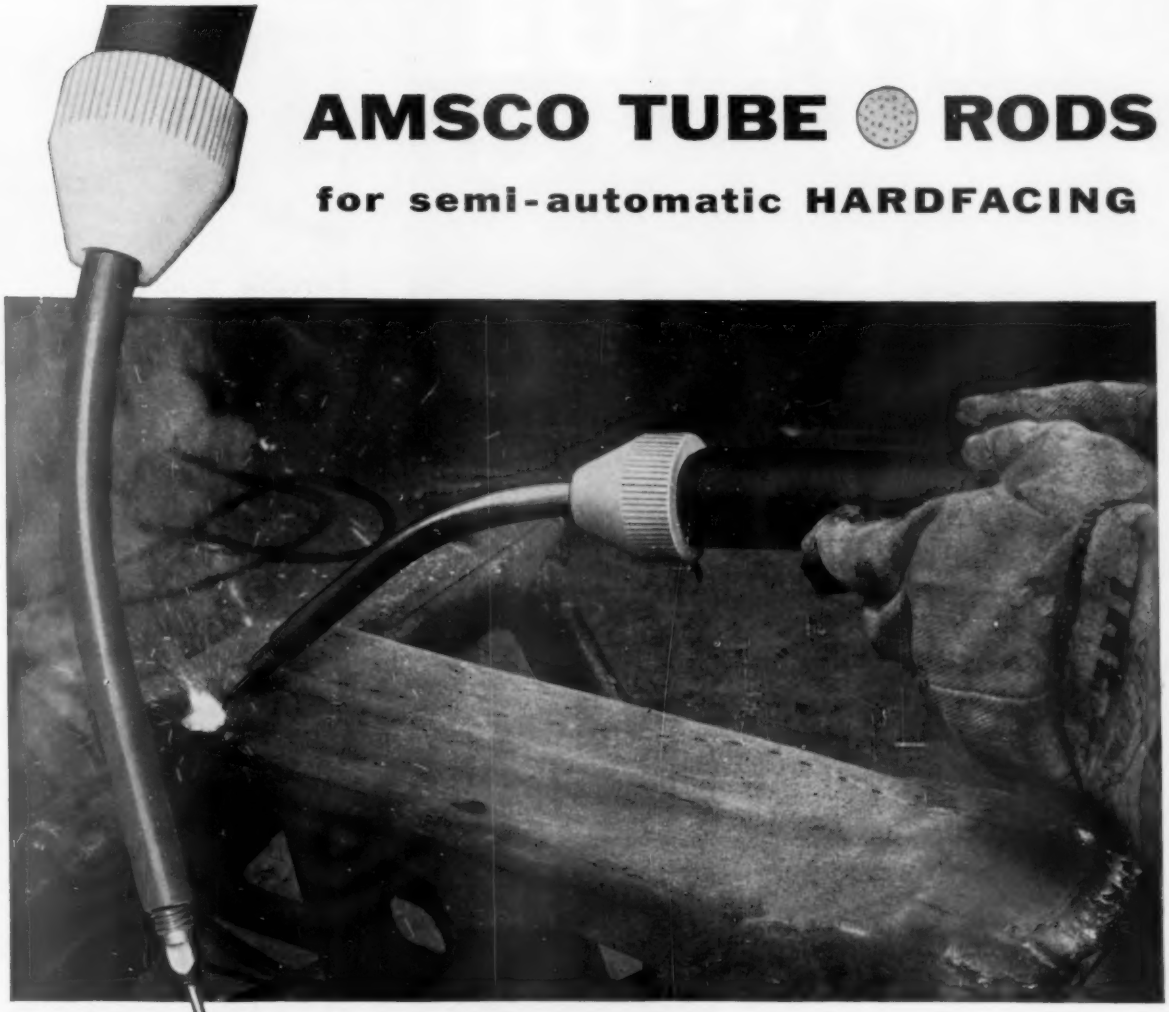
Positioner

WELDING positioner model "10P" is for automatic welding requiring close speed regulation. This positioner has a load capacity of 1,000 lb at 4-in. eccentricity and 4-in. center of gravity. The round table has diameter of 29 in. with 4 radial t slots. It is designed for handling lightweight weldments in manual and automatic welding operations. Positioner has height adjustment of 27 to 42 in. by manual or motor-operated elevation. Controls are located at remote pendant station. *Worthington Corp.*

Circle No. 13.

AMSCO TUBE ROD

for semi-automatic HARDFACING



The perfect uniformity of Amsco Tube Rod insures smooth, trouble-free feed to the work. Note hardfacing alloy compactly enclosed within the steel tube.

Here are new, improved tube rods . . . *specially designed and engineered* for semi-automatic hardfacing! They have *proved* their speed, quality of weld and uniform deposit in actual use tests. In many cases, deposition rate has been increased up to 200% over other types of semi-automatic electrodes.

Amsco® Tube Rods are perfectly symmetrical, steel-shell wires, with the various alloys firmly enclosed and evenly distributed, for proper weld deposit. The steel shell is work-hardened to provide rods that will not deform or snarl during welding . . . that will run well in any semi-automatic welder. The rods are pre-lubricated, to insure constant and uninterrupted feeding to the work.

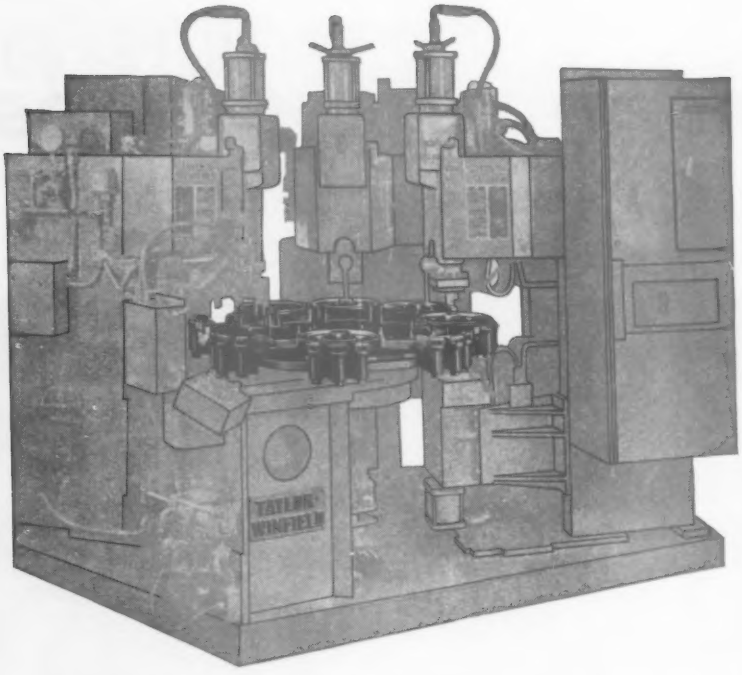
For additional information and technical data on Amsco Tube Rods or the Amsco MF Semi-Automatic Welder, see your Amsco Welding Distributor. Or write to Amsco Welding Department SA, Chicago Heights, Ill.

AMERICAN Brake Shoe COMPANY

AMSCO

American Manganese Steel Division • Chicago Heights, Ill.

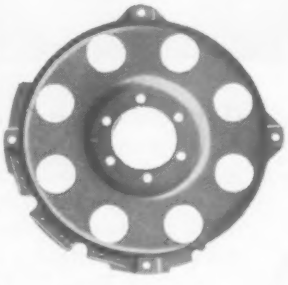
OTHER PLANTS IN: DENVER, LOS ANGELES, NEW CASTLE, DEL., OAKLAND, CAL., ST. LOUIS; JOLIETTE, QUEBEC



T-W Mechanized Handling Triples Standard Weld Production

Three standard projection welders, mounted around a rotary index table, assemble automobile flex-plates at 600 per hour. In service, this flex-plate connects the automobile flywheel to the crankshaft.

One operator loads three counterweights and a flex-plate on an index table fixture. The machine automatically indexes and welds the weights to the plate at three separate stations. The operator loads continuously and assemblies are unloaded automatically.



Flywheel Flex-Plate

Your use of specially-arranged standard welders readily permits modification, if required by future product design changes. Contact the nearest T-W office for prompt attention to your weld production requirements.

The TAYLOR·WINFIELD *Corporation*
WARREN, OHIO

ELECTRIC RESISTANCE AND ARC WELDING MACHINES

Sales and Service

CHARLOTTE · CHATTANOOGA · CHICAGO · CLEVELAND · DALLAS
DAYTON · DENVER · DETROIT · LOS ANGELES · PHILADELPHIA
PORTLAND, OREGON · SEATTLE · ST. LOUIS · STAMFORD
OAKVILLE AND WINDSOR, ONTARIO

Portable welder

SMALL compact welders are portable and are said to be ideal for general maintenance and repair work. Welders operate on 50% duty cycle. Model "200A" delivers 200 amp on 230-volt lines and 180 amp on 115 or 208-volt lines. It weighs 65 lb and has maximum 25 volt output, allowing contact or arc welding. Larger model "400A" works on 440 or 230-volt lines. Other welders are available. *Power Arc Corp.*

Circle No. 14.

Welding rod

FLUX-coated bronze rod is for welding bronze, brass and braze welding cast iron and steel. Eliminating hand fluxing, the new rod "Redifluxed Bronze No. 30," is an all-purpose, low fuming bronze. It melts at 1,625 F and has good tinning qualities. It is made in 3/16 and 1/8-in. diameters, packed in 10-lb tubes. *National Cylinder Gas Co.*

Circle No. 15.

Grinding wheel

SAFETY and ease of operation are features of reinforced grinding wheel. New design, known as "Safety Back," (unique concept of flared cup wheel construction) offers strength and breakage resistance. Steel covers entire back and extends down the side for reinforcement.

The "Safety Back" aids in overcoming abusive wheel mounting. Steel-backed threaded steel insert provides convenient and secure mounting. *Raybestos-Manhattan, Inc.*

Circle No. 16.

Torch handle

MOST precision model air-acetylene outfits of this firm are now supplied with "Prest-O-Lite 403" torch handle. It has needle valve for those who require valve at rear of handle. Torch handle connects directly to 3/16-in. fitted hose assemblies through threads on needle valve. Overall length is 7 9/16 in. and weight is 10 oz. The "401" handle is still available as an accessory. *Linde Air Products Co.*

Circle No. 17.

Plant, Research Laboratories and World Headquarters

BETTER FASTER

Low Temperature EUTECTIC WELDING ALLOYS

STRONGER WELDS

EUTECTIC Welding News

PUBLISHED BY EUTECTIC WELDING ALLOYS CORPORATION, 40-40 172 STREET, FLUSHING 58, NEW YORK, N. Y.

"EUTECTIC" WELDING HEADLINES • TIME-MONEY-MACHINERY SAVERS

XYRON 2-25 REPAIRS RR DIESEL ENGINE SAVES $10,800, WEEKS OF DOWNTIME

A large break in the first cylinder of a 600 horsepower diesel engine almost resulted in the loss of $10,800 by a Midwestern railroad. Attempts to repair the engine with conventional high heat welding materials failed because the block was thoroughly dirt and oil soaked and its tremendous size made pre-heating impossible.

Fig. 1

The railroad's maintenance foreman was ready to recommend scrapping the engine when Eutectic's District Engineer suggested welding with patented Xyron 2-25, "Eutectic's" newest and most advanced electrode for all types of grey and alloyed cast iron. Xyron 2-25 is usable fast and cold and is the first non-cracking, porosity free, all position electrode for cast iron.

Fig.2

Repair was begun by veeing out all broken surfaces with Eutec-ChamferTrode, high speed gouging electrode for all metals. (Fig. 1) Gouging with ChamferTrode provided a good surface for deposits of Xyron 2-25 and burnt out many of the impurities in the casting. After the broken parts were reassembled on the engine block, Xyron 2-25 was used to tack weld. (Fig. 2).

Welding machine was set at 100 amps, DC reversed. The weldor then used a stringer technique with short arc to deposit 2" passes of Xyron 2-25. Peening after each pass relieved stress and slag was easily removed.

Final results were excellent. Xyron 2-25 produced dense, smooth, porosity free deposits at lowest amperages. (Fig. 3) Fast repair with Xyron 2-25 saved railroad $10,800 replacement cost and avoided weeks of downtime. ***(A-71)***

In answering industry's requests for technical data, Eutectic's research and engineering staffs help industry save thousands of dollars each year. Your questions, like these below, will be answered without obligation by Eutectic's Technical Information Service.

Q. My company's welding manual makes reference to the use of solder in the repair of lamp socket contacts. EutecRod 157 with Eutector Flux 157 was recommended to us for this application. Will you advise? We would like to incorporate this information in our manual for future use. The fact that this soldering is performed by unskilled personnel should be considered.

A. EutecRod 157 is considered an ideal recommendation. Since this alloy has an extremely narrow plastic range, rapid solidification takes place, assuring a good build-up. It is therefore easier to handle by the unskilled. Deposits are harder and have higher electrical conductivity than conventional solders. This means greater resistances to pitting and general wear. Since the alloy has a higher solidus temperature, the possibility of plasticizing the build-up if accidental arcing occurs is virtually eliminated. Contacts also will remain bright and clean since EutecRod 157 does not contain lead or other elements than darken with age. Melting point is approximately 430° F. Electrical conductivity is 18 percent.

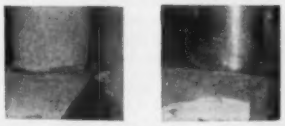
Q. What is the electrical resistance of EutecRods 180, 800, and 1804?

A. Electrical resistivity of all three is almost identical in that values of 23/24 microhms per cubic centimeter are obtained on all tests.

HIGHEST STRENGTH JOINTS WITH EUTECTRODE 201

Welded with patented EutecTrode 2101, the aluminum tine joints on this cement block unloader are up to three times stronger than joints of conventional aluminum electrodes. Loads of close to a ton cause the tines to dip as much as eight inches without cracking. EutecTrode 2101 quickly fabricated the block unloader, produced smooth solid deposits with good color match and high resistance to corrosion. The first aluminum electrode with an extruded flux coating, EutecTrode 2101 does not spatter or fume, produces a quiet arc at lowest amperages. EutecTrode 2101 outperforms all conventional aluminum electrodes. ***(A-72)***

EUTECTRODE 680 AC-DC AVERTS 10 WEEK STOPPAGE



A Tennessee stamping plant faced an 8-10 week production stoppage because of a cracked shaft on a 340 ton press. Replacement was estimated at $15,000. But downtime was averted and replacement cost saved by using EutecTrode 680 AC-DC and Eutec-ChamferTrode to repair the shaft at a cost of only $37 in materials. Eutec-ChamferTrode, high speed gouging electrode, was first used to vee out the crack, which extended 6" through the 12" shaft. EutecTrode 680, patented high tensile electrode for very high alloy and carbon steels, was then applied. Eutec-Trode 680 welds were applied at lowest amperages. ***(A-73)***

Eutectic Welding Alloys Corporation
40-40 172nd Street, Flushing 58, N.Y.

Gentlemen:

I would like further free information on the following:

☐ A-71 ☐ A-72 ☐ A-73

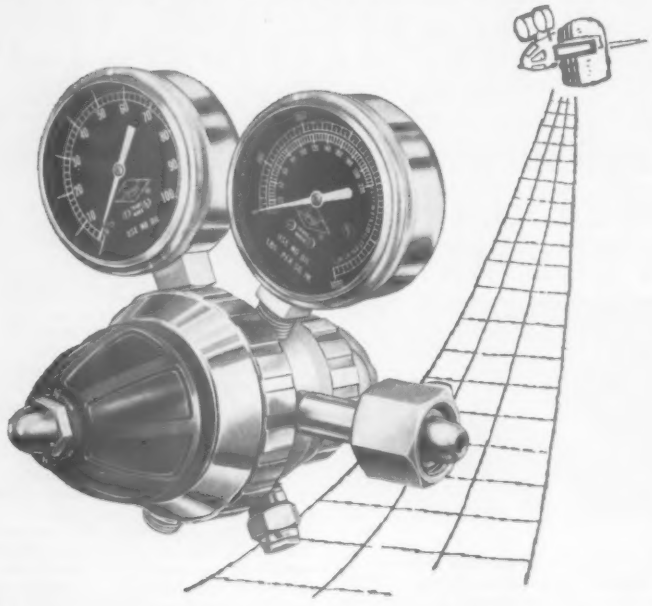
☐ Free 170 page pocket Welding Data Book.

Name_____

Business Address_____

City_____ State_____

A NEW DIMENSION



in gas welding equipment

new All parts are machined from solid bar stock

new Diaphragms are made of special stainless steel

new Safeties are spring-loaded, self-reseating

new *Regulite* adjusting cap—rugged—gives accurate finger-tip control

new Nylon-pointed adjusting screw eliminates metallic friction

new Stabilized seats prevent freezing, vibration and seat ignition

New LIQUIDWELD line of gas welding equipment is not a warmed over design.It presents entirely new concepts in welding engineering . . . design in action, shock-proof performance, friction-free adjustment and new accuracy to meet modern requirements.

The new LIQUIDWELD Regulator shown here is a two-stage type. These regulators provide maximum flame stability through uniformly controlled delivery. Their simplified design minimizes maintenance — they have been tested and approved for greatest operating safety.

New LIQUIDWELD Regulators virtually obsolete your present equipment. They feature *Regulite* adjusting cap that gives finger-tip control . . . easy-reading gauges have colored faces with white calibrations . . . brass finish. In addition to regulators, both single and two-stage, the LIQUIDWELD line includes complete selection of torches and tips . . . expressly designed to be functional!

Write for complete particulars. LIQUIDWELD and GASWELD are divisions of The Liquid Carbonic Corporation, makers of famous Red Diamond Welding Grade Gases.

THE LIQUID CARBONIC CORPORATION

3100 South Kedzie Avenue • Chicago 23, Illinois

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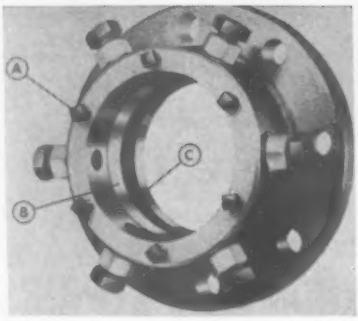


Welding fitting

DESIGNED to make replacement of piping faster and easier where gate valves or other flanged fittings are involved, the "Plidco-Flange" can be welded permanently or bolted for future removal. First cut pipe off, slip "Plidco-Flange" over pipe end and tighten. Tightening end thrust screws *(A)* moves steel thrust ring *(B)* forward to squeeze packing ring *(C)* out between pipe walls. This makes a seal able to withstand several hundreds PSI pressure. *Pipe Line Development Co.*

Circle No. 18.

Sickle grinder

SWINGING sickle grinder is easily operated: just swing grinding wheel back and forth against sickle. This model can be used to advantage in welding and blacksmith shops. Grinder is 23 in. high, can handle sickles 1 to 7 ft in length. *Lantz Mfg. Co.*

Circle No. 19.

Brazing

TYPICAL use of new "Sur-Braze Grade HT-2" ceramic is in brazing stainless-steel honeycombs. The ceramic was developed for high-temperature use. It combines low-thermal expansion with low porosity and compressive strength of 40,000 psi, states the manufacturer. The "HT-2" is available in custom-fabricated shapes or plates to 12 by 12 in. *Technion Design & Mfg.*

Circle No. 20.

Emergency lighting

AUTOMATIC emergency lighting unit, model "E", is for use in case of power failure. It is said to provide illumination for many hours. It is powered by storage battery built into portable set. Trickle charge automatically maintains battery charge. Built-in hydrometer indicates state of battery at a glance. Unit can be plugged into any a-c circuit. Lights are sealed beam of 100 cp and will provide continuous lights for 10 hours. *General Scientific Equipment Co.*

Circle No. 21.

the NEW miller MULTI ARC combination ac-dc welder

The Miller Multi-Arc combination ac-dc welder, built specifically for metallic arc welding, delivers either ac or dc current at the flick of a switch. Electrical control circuit eliminates mechanical controls. Primary switch is standard equipment; Power Factor Correction optional. Six models from 10 to 525 amperes—all with 60% duty cycle ratings.

Complete specifications sent on request.

". . . If it's Miller you know it's the finest . . ."

miller Electric Manufacturing Company, Inc. APPLETON, WISCONSIN

distributed in Canada by CANADIAN LIQUID AIR CO., LTD., Montreal

When You Weld Cast Iron
Select the Correct

Fuse-Well

CAST IRON WELDING RODS
OR ELECTRODES

FUSE-WELL NO. 11

FUSE-WELL No. 11, *Square*—Gray Cast Iron Welding Rod for Acetylene use in filling or building up new or worn castings producing machineable welds.

FUSE-WELL NO. 12

FUSE-WELL No. 12, *Round*—Has the same uses and analytical ingredients as Fuse-Well No. 11.

FUSE-WELL NO. 14 MOLY

FUSE-WELL No. 14, *Moly*—An Iron Base Rod with alloys added for finer grain structure and greater strength.

FUSE-WELL NO. 22

FUSE-WELL No. 22, *Electrode* — Light coated Rod to be used for AC or DC welding in the fabricating and repairing of cast iron castings.

Sold through Leading Distributors

THE CHICAGO HARDWARE FOUNDRY CO.
Weld Rod Division
NORTH CHICAGO, ILLINOIS

Mig spot welding

KIT converts model "21" manual Mig (metal inert-gas) welding guns for arc spot welding. Kit contains auxiliary control panel, outer barrel and flat nozzle. Spot welding of lap joints, or tack welds in butt, lap or fillet joint can be made on mild and stainless steels. *Air Reduction Sales Co.*

Circle No. 22.

Industrial clamp

CLAMP has variety of uses. The "Yates" clamp can be applied to metal parts, plastics, templates, fabrications, etc. Can also be used for bench or wall use. There are 4 types: flat spring-steel clamp with cam lever lock; spring grip clamp (clothes pin type); spring wire clamp with cam lever lock and conveyor clamp with 3 prong saw-tooth steel jaws (stationary or swivel) with cam lever lock. With exception of conveyor clamp, all have rubber jaws. *Wedgelock Corp.*

Circle No. 23.

Brazing furnace

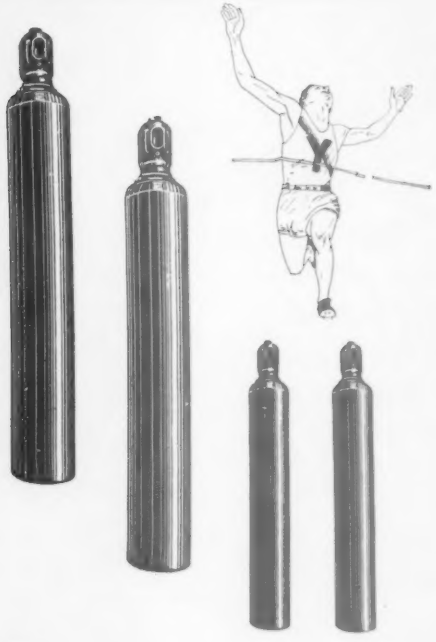
ELECTRIC furnace is designed for brazing, alloying and soldering transistors and other semiconductors. The "Transeat" furnace is said to be accurate to $\pm 0.25\%$ of full scale range. *BTU Engineering Co.*

Circle No. 24.

Steel tape

POCKET-size steel white-tape has ½-in. blade which automatically returns to its case under controlled speed. Self-adjusting end hook compensates for its own thickness when taking inside and outside measurements. Tape has double markings in inches and feet-and-inches, and is packaged in box with magnifying lens. It is available in 6, 8, 10 and 12-ft lengths. *Evans Rule Co.*

Circle No. 25.



HARRISBURG
GAS CYLINDERS
cost less in the long run

In design and manufacture of Harrisburg Seamless Steel Cylinders for high pressure gases, *durability* is a prime consideration. It was Harrisburg that set the high standards many years ago that have caused industry to expect twenty-five years or more of useful service from gas cylinders.

Price is only one factor in the cost of a cylinder. Price divided by the number of years of expected life is the real measure of cylinder values. On that basis Harrisburg offers the best possible buy. This Company makes a complete range of sizes and capacities, to I.C.C. Specifications, in Export and Domestic types.

More than a century in Harrisburg
Harrisburg Steel Co.
Division of
HARSCO CORPORATION
Send for literature and prices, specifying with or without caps and valves.
Harrisburg 8, Pennsylvania

Tame your "difficult" steels

with P&H 170 LA Iron-Powder Low-Hydrogen electrodes

For problem steels like high carbon, alloy, high sulfur, free machining, and cold rolled steels, P&H 170 LA is the real answer.

Its low hydrogen content assures welds of superior X-ray quality even in the toughest parent metals.

Its iron-powder coating gives extra fast deposition to speed up operations.

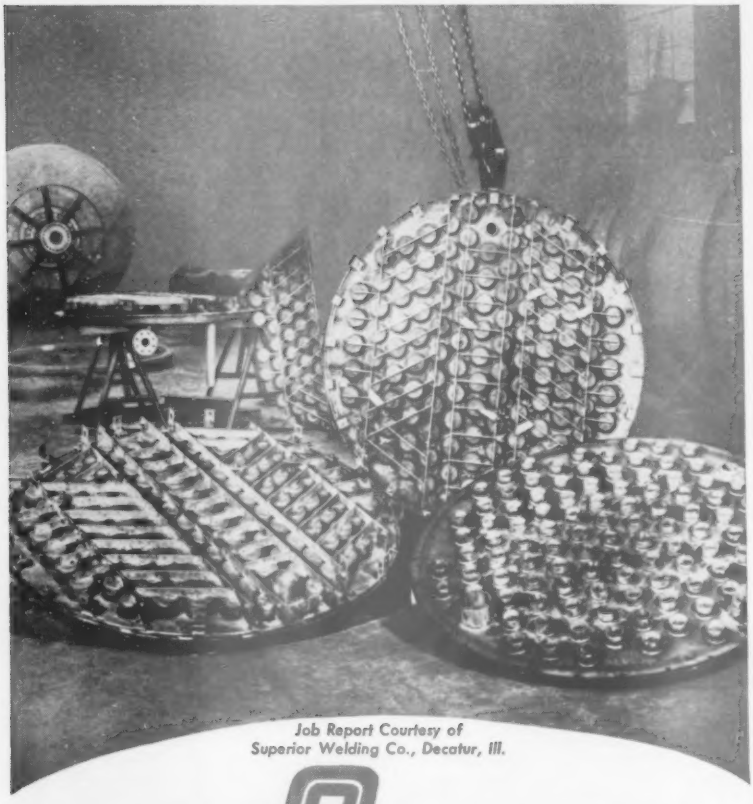
This combination means both high-quality *and* high-speed welds, with improved bead appearance, excellent feathering out, low spatter, and no undercut.

We'll gladly send complete specification data. Write for Bulletin R-29, "P&H Smootharc Welding Electrodes." Dept. 315B, Harnischfeger Corp., Milwaukee 46, Wisconsin.

HARNISCHFEGER

P&H WELDERS · ELECTRODES · POSITIONERS
MILWAUKEE 46, WISCONSIN

When the *quality* of welded equipment is essential to performance



Job Report Courtesy of Superior Welding Co., Decatur, Ill.

WELD WITH ARCOS

STAINLESS ELECTRODES

Welded bubble cap trays, such as these, are used to refine petroleum, petro-chemicals, and food products. They—and the welds—are subjected to corrosion from the liquids and gases passing over them. High processing temperatures intensify the corrosive conditions. ARCOS Chromend KMo Electrodes (Type 316 with 2.5% molybdenum) were used because of their ability to resist acid conditions combined with heat. These electrodes—like all Arcos stainless filler metals—produce welds that are trouble-free both during welding and in service.
ARCOS CORPORATION, 1500 S. 50th St., Philadelphia 43, Pa.

SPECIAL press-type spot welder welds heavy gages of aluminum alloy, heat-resisting alloys, stainless and low carbon steels. Welder is size "4", 200 kva tri-phase model, hydraulically-operated with 18,000 lb maximum force at 30 in. throat. ***The Taylor-Winfield Corp.***
Circle No. 26.

Solder flux

SOLDERING and tinning flux is designed to give clean adhesion between metal and solder. It has low melting point well under that of 50-50 solder. The "Stay-clean" flux flows freely. Available in plastic dispenser bottle, flux can be used on steel, copper, brass and cast iron, but not on aluminum or die-cast alloys. *J. W. Harris Co.*
Circle No. 27.

Air valves

KEYNOTE feature of new "Starline" series of air-control valves is modular construction. Series introduces five new pilot heads which are interchangeable on seven valve bodies. The "White Star" has spool-solenoid pilot head; "Gold Star" has oil-immersed solenoid; "Blue Star" includes remoted - piloted, pressure - operated valves. *Ross Operating Valve Co.*
Circle No. 28.

Air regulator

COMBINATION filter-regulator-lubricator is for automatic filtration, regulation and lubrication of air supply to pneumatically-operated equipment. Filter has "tornado action" which gives powerful downward spiral motion to incoming air. Regulator has "aspirator" giving regulation of reduced pressure under sudden, heavy and/or widely varying flow demands. Lubricator has high-velocity venturi section for vaporization and assimilation of metered oil. Internal by-pass parallels venturi and provides uniform pressure drop. *Watts Regulator Co.*
Circle No. 29.

RW welder

MINIATURE resistance welder was developed for welding thermocouple junctions and leads and as tacking welder to secure thermocouples, strain gages, thermistors, etc., to large bodies.

Welding head can be used as small low-inertia foot-operated bench welder, with adjustable pressure of 1-10 lb or can be removed from case and used as single electrode tacking tool. Ground wire is supplied for tacking.

Welder has built-in power supply which can be connected to any 115-volt a-c line. Two types of power supplies are available—stored energy model "PW6" (line drain of 50 watts with welding pulse of 5,000 amp peak) model "PW6T" with small a-c supply, electronic timer and heat regulation (rated at 0.5 kva for connection to 115 volt a-c lines). Units are mounted in sturdy carrying case with compartment for cables and tools. *Ewald Instruments.*

Circle No. 30.

Machine vise

HEAVY-DUTY machine vise has 8½-in. jaw width and 6¾-in. maximum jaw opening, with steel jaw plates in place. Plate removal allows another 1¼-in. jaw opening. The "P-3" vise weighs 194 lb, and is ideal for welding positioning. *Universal Vise & Tool Co.*

Circle No. 31.

Power supply

D-C STORED-energy power supply is for high-production precision welding. Rated at 18 watt-seconds, the "18A" power supply is equivalent to a 5.8 kva a-c system. Stored-energy obviates high-current lines.

Adjustments include heat control varying between 425 and 1,150 volts and weld time control. Designed for bench mounting, "18A" measures 13 by 10 by 10 in., including built-in transformer. Can be used with small welding heads or tweezers. *Raytheon Mfg. Co.*

Circle No. 32.

When heavy chrome-moly welds must pass X-Ray Inspection

Job Report Courtesy of American Pipe and Steel Corp., Alhambra, Calif.

WELD WITH ARCOS

CHROME-MOLY ELECTRODES

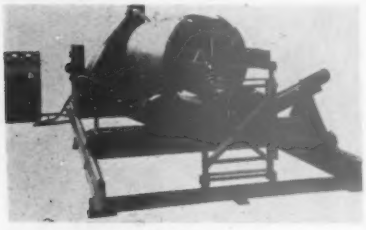
In setting up this job—fabricating heavy alloy components of lead melting pots—new welding procedures were required to assure that all welds would pass x-ray inspection. With the help of Arcos Technical Service, both manual and submerged arc procedures were established and ARCOS Electrodes and Rods were used exclusively. The quality of Arcos weld metal consistently assures internally sound, flaw-free welds. And Arcos Technical Assistance prevented problems on what could have been a "tricky" job. ARCOS CORPORATION, 1500 S. 50th St., Philadelphia 43, Pa.

Tank grinders

THREE new coated abrasive-belt machines are for grinding and polishing large diameter tanks. The machines are: seam weld grinder and polisher, ID tank grinder and polisher, tank head grinder and polisher. Coated abrasive belts were especially designed.

Seam weld grinder

Seam weld grinder can handle welds on flat sheets or open end tanks to 10 ft long. It has traversing head with control console. Gantry seam weld grinder is also available.



ID tank grinder

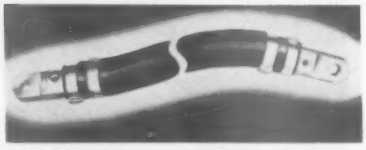
ID tank grinder takes tanks from 33 in. to 20 ft and to 12 ft long. Abrasive belt is mounted on traversing grinding head.

Companion to seam and ID grinder is "Hi-Lite" tank head grinder and polisher operating on principle of swing grinder. Operator has full vision of point of contact. *Hi-Lite Polishing Machine Co. & Minnesota Mining & Mfg. Co.*

Circle No. 33.

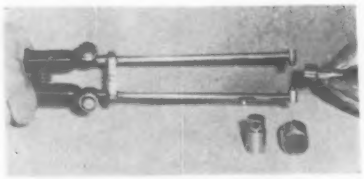
Welding cable

DESIGNED for portable resistance welding tools, this welding cable offers kickless operation and simplified low-weight terminals. The cable consists of two large conductors of fine wire, insulated by flexible separator, encased in wear-resistant hose. Terminals and secondary welding connectors also available. *Uniflex Cable Division.*



BROKEN view of welding cable with cross-section design for flexibility.

Circle No. 34.



Manual torch

NEW manual oxygen-fuel gas torch has three interchangeable tips. The tip can be changed by squeezing the handles. Tip then drops out and can be replaced by insertion of new tip between prongs. Tip can be tilted to any angle. "Instochange" torch uses manufactured or natural gas as well as hydrogen, propane and other gases. Flame adjustment is by thumb control of two valves—one for fuel, other for oxygen. *Bethlehem Apparatus Co., Inc.*

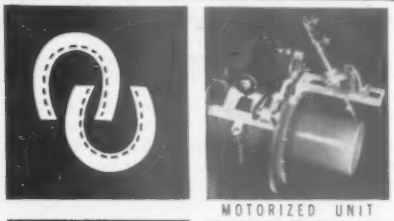
Circle No. 35.

Plastic welding

WELDING thermoplastic materials is function of new gun. In operation, gun directs stream of hot air on material (such as polyvinyl chloride and polyethylene) and the welding rod so that both reach plastic state together. Firm pressure on welding rod fuses materials. *Quelcor, Inc.*

Circle No. 36.

2 MORE CHAMPIONS . . FROM THE SAME STABLE



MOTORIZED UNIT

FLEXIBLE SHAFT

H & M offers *complete visibility* in pipe cutting and beveling. H & M's *Flexible Shaft* and the H & M *Motorized Unit* both allow the operator to stand *in front* of the pipe being beveled and observe the bevel through the complete 360 degrees.

The FLEXIBLE SHAFT attaches quickly and easily to any H & M machine, and allows the operator a full view of the circumference of any size pipe, while regulating the speed of the torch.

The MOTORIZED UNIT provides complete automation of pipe cutting and beveling, and is easily and economically attached to any H & M machine. With an easily-regulated, governor-controlled motor, consistently smooth and perfect cuts and bevels are attained . . . AUTOMATICALLY.

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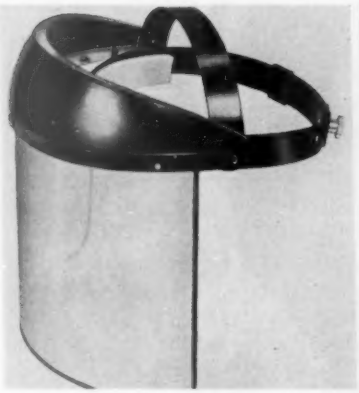


Face shield

SOFT plastic headframe of new face shield molds to any shape, reports the manufacturer. Additional features are: all plastic spark deflector; positive slide adjustment for headsizes 6 to 8½; foam rubber snap-in and snap-out sweatband. Shield also has extra wide acetate visor with single snap fastener, plastic bound visor. Can be worn with prescription glasses. *Pulmosan Safety Equipment Corp.*

Circle No. 37.

Ultrasonic cleaner

ULTRASONIC cleaner is portable and lightweight. Model "Glennite U-621" is for industrial cleaning of small precision parts. Operating at 40 kc, portable unit has automatic timer, variable to 55 minutes. Cleaning tank capacity is 2 pints. Ordinary detergents or chlorinated solvents are used. *Gulton Industries.*

Circle No. 38.

Welding shield

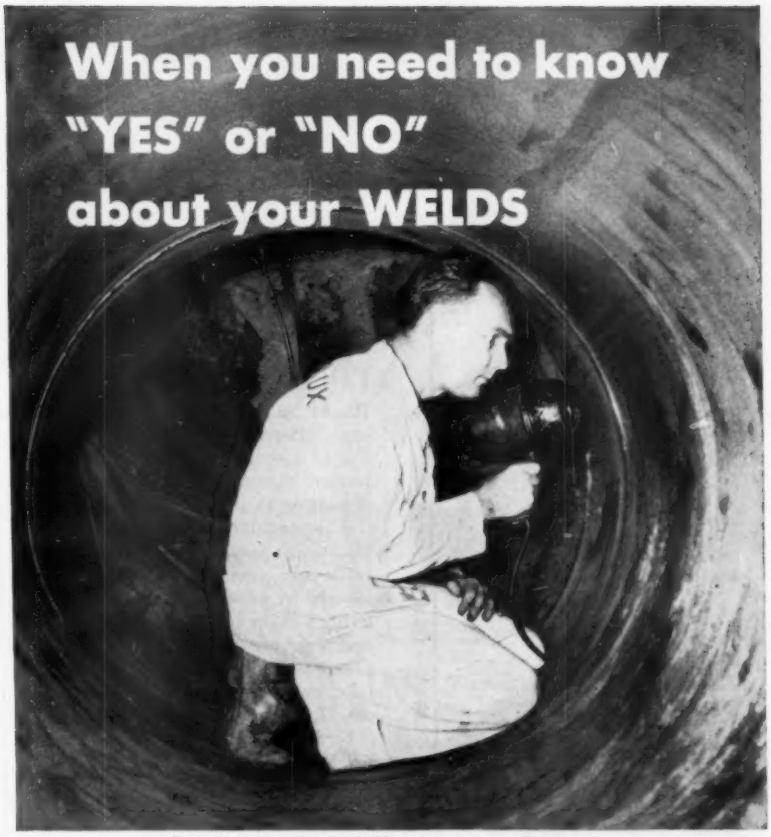
SELF-standing portable welding shield has incorporated "Ray-Tex" durable heat fabric. The "Spa-Fla" offers positive resistance to high radiant heat, hard usage, dirt, oils and greases and most acids and alkalies. This welding shield is easily rolled and carried from job to job—48 by 72 in. shield weighs less than 20 lb, reports the manufacturer. *Frommelt Industries, Inc.*

Circle No. 39.

Aluminum cleaner

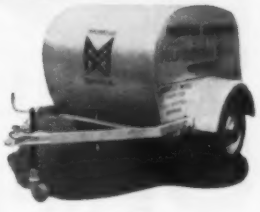
NON-FOAMING cleaner removes identification inks, grease, oils and other heavy soils from aluminum. Cleaner "164" was specially compounded to act without foaming in agitated tanks. It can be used, however, states the manufacturer, without agitation. Cleaner is used at 6-8 oz per gallon of water at temperatures between 160 and 180 F. *Oakite Products, Inc.*

Circle No. 40.



Zyglo inspection of welds inside power station main water line

Call On **MAGNAFLUX**
NATION-WIDE
COMMERCIAL
INSPECTION SERVICE



We can help you assure consistent weld quality and cut welding costs. Here's why:

Magnaflux Commercial Inspectors are trained *inspectors*—not just rejectors. Working with all the Magnaflux test methods, they know it is just as important to recognize *good* welds as to find defective ones. Needless rejection for harmless defects piles up costs and rework.

These inspection specialists can help you to find *how* defects occur. Then, through better job control and techniques, you'll get more good welds, fewer rejects or reworks. You don't need to inspect *all* welds—just the critical ones. But for these you need full reliability of inspection!

Low-cost Magnaflux Field Inspection is as near as your telephone—to inspect anything, anywhere . . . for regular maintenance inspection of plant equipment, construction work, pipelines, all kinds of heavy equipment. You may use it on planned schedules or to meet sudden inspection needs—anywhere, any time.

With Magnaflux Commercial Inspection Service—you get the benefit of a nation-wide standard of inspection, by Magnaflux own trained experts and genuine Magnaflux Methods: Magnaflux-Magnaglo, Zyglo, Sonizon ultrasonic testing and others.

Write for full details now—
OR CALL ANY OF THE COMMERCIAL INSPECTION BRANCHES SHOWN BELOW.

HALLMARK OF QUALITY IN TEST SYSTEMS

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Minneola, L. I., N. Y. Pioneer 7-3220	Philadelphia, 33 BAldwin 3-5500	Detroit 11 TRinity 3-4343	Dallas 19 Fleetwood 2-2626
Newark 4, N. J. HUmbolt 3-1235	Pittsburgh 36 TUxedo 2-3448	Indianapolis 18 LIberty 7-1303	Houston 23 WAlnut 1-4219
Hartford, Conn. JAckson 8-6844	Cleveland 15 HEnderson 2-0727	Chicago 47 EVergiade 4-1561	Los Angeles 58 LUdlow 8-4173
Bridgeport, Conn. EDison 6-2113	Cincinnatti 23 MUlberry 1-6436	Tulsa LUther 3-2816	Oakland 8 OLympic 8-0201

Dockson GOGGLES

REAL PROTECTION—TRUE COMFORT—TOP VALUE

DOCKSON'S complete line of goggles offers the finest, scientifically designed protection at minimum cost. Their many outstanding features and unusual comfort have earned them top preference in industry.

Write for complete catalog and name of your nearest distributor.

Dockson CORPORATION

3839 WABASH AVE • DETROIT 8, MICHIGAN

CO_2 regulator

HEAVY DUTY carbon-dioxide regulator, "Oxweld R-69-400," is designed for CO_2 cylinders or manifolds. Effective operation occurs at delivery pressures to 200 lb per square inch.

This regulator can be used in applications from control of delivery rates for pressurizing premix containers in bottling industry to regulating CO_2 in core-molding. Regulator operates on two-stage principle of pressure reduction. Porous filter in inlet connection blocks and absorbs dirt. *Linde Air Products Co.*

Circle No. 41.

Pyrometer

INDICATING pyrometer has been redesigned with mirror scale to cut down parallax. Medium-resistance pyrometer (4 ohms per millivolt) is available in 21 ranges. Pyrometer may be thermistor-compensated for accuracy despite ambient changes. Styles include panel mounting, portable and bench models. Meters are 3¾ and 4½ in. wide. White background with black lettering is standard although black faces are available. *Assembly Products, Inc.*

Circle No. 42.

Soldering torch

Two improved, internally-fired soldering torches are for use with "Insto-Gas." The torches are designed to give quick, continuous soldering heat at the copper tip. Air and gas flow can be regulated.

Torches can melt solder 90 seconds after lighting, and tip reaches 1,000 F in 3½ minutes, states manufacturer. Two sizes are available: "10-S-2" with 2-lb per pair copper and "20-S-5" with a 5-lb per pair copper for heavy work. *Insto-Gas Corp.*

Circle No. 43.

For more information use card on page 123

An outstanding new general purpose electrode for AC or DC with a soft, stable arc for all position welding. A new development in iron powder electrodes for higher currents and faster welding. You'll be amazed how simple and easy it is to use. You'll like the "drag" or "short arc" technique and the greater speed that means lower welding costs for you. You can't afford to overlook the advantages of Hobart "Rocket 14." Takes only a few minutes to prove to yourself on your own work. Hobart Brothers Co., Box U-572, Troy, Ohio, Phone FE 2-1223

Hobart

to: HOBART BROTHERS CO., Box U-572, TROY, OHIO

- ☐ Send information on "Rocket 14."
- ☐ I would like to try some samples.
- ☐ Send complete catalog on electrodes.
- ☐ Send catalog on arc welding machines.

Name_____

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City_____ County_____ State_____

NEWS . . . . . *from page 6*

Recently Olin initiated an expansion program in the aluminum field. A plant at Clarington, Ohio, when completed in 1958, will have annual capacity of 120,000 tons of aluminum sheet and coils.

AEC contract to Foote Mineral

Foote Mineral Co. has contracted with the Atomic Energy Commission to supply major quantities of lithium hydroxide. The quantity of material involved and the end use for the lithium to be provided in the five-year contract are still classified. AEC is principally interested in the lithium-six isotope.

According to Foote, commercial quantities of "tails" (material depleted with respect to the lithium-six isotope) will be available. Foote also stated the contract does not foretell shortages of lithium and that there is more lithium available to industry now than ever before.

New warehouse for Atlas Welding

Atlas Welding Accessories, Inc., Detroit, has completed its new warehouse and began shipping from it on April 1. The new structure, adjacent to the Atlas manufacturing plant, provides 4,000 sq ft of warehouse space.

Reynolds to mine Jamaican bauxite

Reynolds Metals Co. has signed a contract with the Government of Jamaica to mine bauxite. The company plans to ship at the rate of more than 2,000,000 tons this year.

Sylvania-Corning Corp. to build

The newly-formed Sylvania-Corning Nuclear Corp. (jointly owned by Sylvania Electric Products Inc. and Corning Glass Works) plans to build a facility at Hicksville, N. Y., to produce atomic fuel elements for reactors used in research and electric power generation. Construction will begin in May, with completion by late summer.

The firm was formed for expanded research, development and production in the atomic energy field. Officers of the new firm are Dr. Lee Davenport, president and treasurer, Walter E. Kingston, executive vice president, and Howard M. Cohen, secretary.

Safety . . . ? It's good business

Safety and good business practices go hand in hand—it's easy if seven basic steps are observed, according to the National Safety Council. Single copies of a leaflet describing these steps for industrial safety is yours for the asking from the Small Business Program of the council, Chicago 11.

Lithium institute launches research

The American Lithium Institute has begun a program of sponsored research on lithium alloys at Massachusetts Institute of Technology and on lithium-containing glass at Pennsylvania State University. The institute will also establish fellowships at both institutions. A member company of the recently formed organization is Foote Mineral Co.

To investigate titanium, silicon

Construction has begun on a fifth laboratory building at Chestnut Run near Wilmington, Del., for Du Pont Co's research and development work on titanium and silicon.

Design show to be in New York

New York City will be the location for the 1957 Design Engineering Conference, May 20-22, at the New York Coliseum. Sponsored by the American Society of Mechanical Engineers, there will be three days of technical sessions, and exhibits of newest techniques and materials. Of interest to weldors will be exhibits and discussions of new developments in high-temperature metals and alloys, new processes of coating and finishing, and controls.

Selas to contract for research

Selas Corp. of America, Dresher, Pa., has arranged its laboratory program to undertake research projects for firms with problems in heat and fluid processing. A contract research sales division has been formed under the guidance of Robert C. LeMay.

ASM to hold metal congress

May 12-16, 1958, will see the first Southwestern Metal Congress & Exposition in Dallas. The event, to take place in the Automobile Building at the State Fair Park, will be sponsored by the American Society for Metals.

For WELDING Savings—Install Dry® Rod Electrode Ovens

Avoid Scrap Losses, Reworks—Rejects

Your DRY-ROD Oven insures against defective welds caused by moisture. Protects low-hydrogen, austenitic, special alloy electrodes, as well as iron powder contact rods. Aids steadier welding, with less slowdown, reworks, and scrap. Repays its cost out of rod salvage alone. Costs less than 15c in 24 hours.

DRY-ROD is completely wired, ready to use. Available in 2 sizes for all industrial requirements. See your welding supply dealer.

Dry® Rod

DIVISION OF

PHOENIX PRODUCTS CO.

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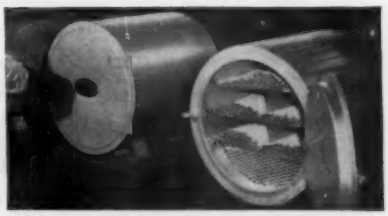
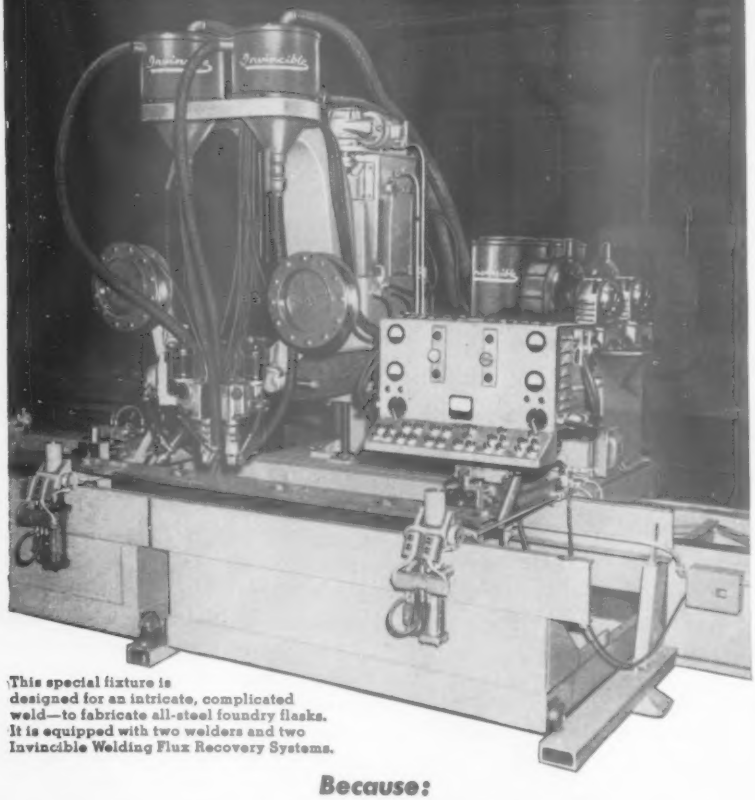
X-dr-22



Welding Fixture and Positioner Manufacturers Specify . . .

INVINCIBLE

WELDING FLUX RECOVERY SYSTEMS



This special fixture is designed for an intricate, complicated weld—to fabricate all-steel foundry flasks. It is equipped with two welders and two Invincible Welding Flux Recovery Systems.

Because:

- INVINCIBLES recover *all* unfused flux on submerged arc welding jobs, remove powder and return slag-free, dust-free flux to the welder in a *continuous* flow. Savings in reclaimed flux *alone* repay their cost in a few months, or even weeks. And they save costly man-hours over manual methods, speed production, minimize costly rejects by eliminating flux flour.
- INVINCIBLES are available in 14 standard automatic and manual models from 1½ to 7½ horsepower *plus* special machines and combinations. All feature compactness, flexibility and rugged construction.
- INVINCIBLE's resident engineers in all principal cities will assist you in achieving maximum savings from submerged arc welding operations.

***SEND FOR FOLDER** on Invincible Flux Recovery Systems*

INVINCIBLE VACUUM CLEANER MFG. CO.
DOVER, OHIO

OVER 50 YEARS THE LEADER IN INDUSTRIAL VACUUM EQUIPMENT

Welded sculpture—self-taught

FLAME-sculptured 28-in. bronze torso was produced by the oxyacetylene torch. The flame created unusual tone gradations and texture.

A self-taught Cuban sculptor, Ernesto Gonzalez, who uses oxyacetylene welding, demonstrated his technique, under the auspices of Linde Air Products Co., at the American Welding Society exposition in April. Ernesto became interested in the welding torch during a tour of the United States and, buying an outfit, taught himself to weld.

Ernesto forms his larger pieces by first welding a rod framework and then moulding molten metal around the frame into the shape he desires. Small figurines are made by melting welding rod and forming it under the oxyacetylene flame. *(For more on welded sculpture and new Linde art award, see* WELDING ENGINEER, *April, p. 100.)*

Norelco to hold X-ray school

An X-ray diffraction school will be held by Philips Electronics, Inc., Instruments Division, at the Madison Room, Morrison Hotel, Chicago, June 3-7.

Name change for Olin Revere

Ormet Corp. is the new name of Olin Revere Metals Corp. It is jointly owned by Olin Mathieson Chemical Corp. and Revere Copper & Brass Inc. The name was changed to end confusion about extent of joint effort between the two firms. Ormet produces primary aluminum which is fabricated by Olin Mathieson and Revere and sold by both in a competitive situation.

Danny says:

"Airco's complete line of stainless steel electrodes eliminates guesswork"

Airco provides me with a stainless steel electrode with a deposit to match the base metal of any item to be welded. I don't guess — I select! The AC-DC coated electrode is the favorite with most operators. The arc action is smooth. The bead looks exceptionally good and slag is easy to remove.

Why not send for the free Airco Electrode Guide which will help you select the right electrode for your specific job. Request catalog 1318.

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AIR REDUCTION SALES COMPANY

A Division of
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Form vacuum melting firm

The Vaculloy Corp. has been formed in Wooster, Ohio, by James H. Johnston and Edward R. Funk. The new firm is currently engaged in custom vacuum melting of titanium, steel and other alloys for research, laboratory and development.

Rectifier conference in June in Chicago

A panel discussion on application and maintenance of power rectifiers will highlight the June 4-5 Power Rectifier Conference at the Morrison Hotel in Chicago, sponsored by the American Institute of Electrical Engineers.

Carbon arc welding is research aid

The theory of carbon-arc welding has been used by the Chicago Midway Laboratories of the University of Chicago to develop a device for behaviour study of materials at extremely high temperatures. To produce a jet of atomic vapor twice as hot as the sun's surface a water-stabilized electric arc was developed. The new device squeezes the heat of a carbon arc—the same arc used in carbon-arc welding. Heat of the device comes from electricity streaking across the gap between two graphite electrodes—lower one a rod, upper one ring-shaped.

Norelco opens new office

A new office has been opened at 1825 Grant Ave., Philadelphia, by the Instruments Division, Philips Electronics, Inc. It replaces the office formerly located in Newark.

IAA offers cutting aid

An up-to-date, revised edition of the pamphlet "Oxy-Acetylene Cutting" is currently available for 50 cents a copy from the International Acetylene Association. Members of IAA will receive one free by mentioning "members complimentary copy" in their request.

To recruit technicians

Aimed at correction of technical manpower shortage, a technical personnel recruiting exposition will be held at the Sherman Hotel in Chicago, June 8-12. It will be held along with the National Technical Career Conference.

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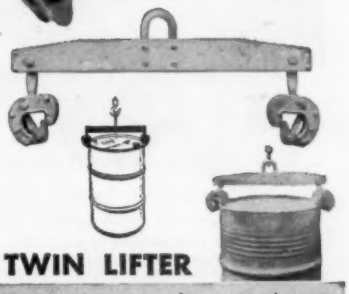

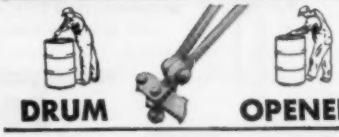

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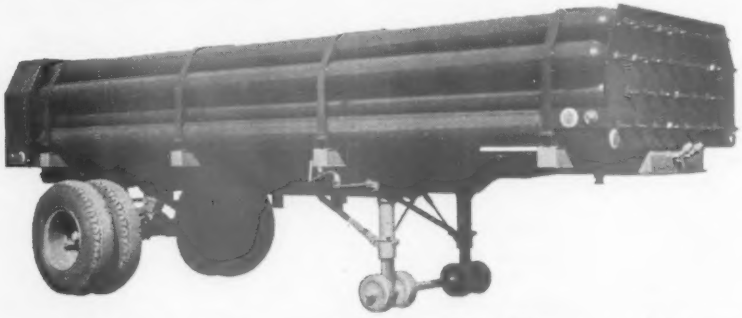

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- Accumulated carbon and slag removed *without* scratching or enlarging orifice
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COMING EVENTS

MAY 12-16: First Southwestern Metal Congress & Exposition, American Society for Metals, State Fair Park, Dallas.

MAY 13-16; Thirteenth Annual Convention, National Welding Supply Association, Hotel Mayflower, Washington, D. C.

MAY 20-23: Design Engineering Show, Coliseum, New York City.

MAY 20-24: Sixty-first Annual Meeting, National Fire Protection Association, Hotel Statler, Los Angeles.

MAY 25—June 10: Forty-sixth Annual Paris International Trade Fair, Paris, France.

JUNE 11-13: Third Western Plant Maintenance & Engineering Show, Civic Auditorium, San Francisco.

JUNE 19-21: Summer Meeting, Compressed Gas Association, Seaview Country Club, Absecon, N. J.

JUNE 28-JULY 14: Chicagoland Fair, Chicago Association of Commerce & Industry, Navy Pier, Chicago.

JUNE 29-JULY 6: Annual Assembly, International Institute of Welding, Essen, Germany.

JULY 1-3: Summer Meeting, Independent Oxygen Manufacturers' Association, Broadmoor Hotel, Colorado Springs, Colo.

OCT. 7-9: National Electronics Conference, co-sponsor Illinois Institute of Technology, Hotel Sherman, Chicago.

OCT. 21-25: National Safety Congress, Chicago.

OCT. 27-NOV. 1: Fourth Annual conference, Atomic Industrial Forum, Second Fall meeting, American Nuclear Society, and Trade Fair of Atomic Industry, Coliseum, New York City.

NOV. 4-8: Thirty-ninth National Metal Exposition & Congress, concurrently with Second World Metallurgical Congress, American Society for Metals, International Amphitheatre, Chicago.

Welded skeleton for steeple

Welding has played a part in the renovation of St. Joseph's church, oldest Catholic parish on Chicago's north side. The skeleton for a new 80-ft stainless steel steeple was welded.

To explore the Bolivian minerals

Ventures Ltd. of Canada and Vitro Minerals Corp., New York City, have formed a jointly-owned company, Bolivex Corp., to explore the untapped mineral wealth of Bolivia, S. A.

Grinder put on permanent display

The only one of its kind in 1916, a machine surface grinder is now on permanent display at the Smithsonian Institute, Washington, D.C.

Developed by Frank MacLeod and George Gant, the grinder was the first to utilize a solid one-piece casting frame with motor mounted on the inside. This design is still used today. Development of the grinder spurred the founding of Abrasive Machine Tool Co., East Providence, R. I., which gave the grinder to Smithsonian.

Air Products opens new sales office

Air Products, Inc., Allentown, Pa., has established a new sales office for its cylinder gas division in the Grant Building, Pittsburgh.

Facilities for the manufacture of oxygen, argon and other gases will be located in Aliquippa, Pa., and will serve Pittsburgh and western Pennsylvania. C. W. Doumont, formerly district manager in Parkersburg, W. Va., has been named manager of the new operation.

Houston office for Alloy Rods

Alloy Rods Co., York, Pa., has opened a new sales office and warehouse at 2201 Dallas Ave. in Houston, Tex.

New research in protective coatings

Extensive research in protective industrial coatings has begun by Gulton Industries, Metuchen, N. J., and The Lithium Corp. of America, Minneapolis. Initial research will be on porcelain enamel coatings for light architectural metals and in high temperature ceramic coatings for aircraft and guided missile structural materials.

SAVE TIME AND MONEY!

A SMOOTH SWING of the Contour Marker's soapstone point and you're ready to cut! It's easy and *absolutely accurate* because there is an angle dial calibrated in both degrees and pitch. Any of the pipe joint angles shown can be marked off in minutes. And you save "man hours" as well as oxygen and acetylene gas because "cut and try" methods are completely eliminated. Two sizes are available complete with adapter for marking structural steel. Standard, for pipes from 1½" to 18" dia.; Jumbo, for pipes from 16" to 48" dia. Instruction book included. Belt case available. Write for information

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(Formerly Wagner Mfg. Co. Inc.)
JACKSON . . . . MISSOURI
Weld with HI-AMP

B&W to build nuclear ship

Babcock & Wilcox Co. has been awarded a contract from the Atomic Energy Commission for the design, development and fabrication of a nuclear reactor and components of propulsion plant for the first nuclear-powered merchant ship. The project is scheduled for 1960 completion.

GM begins new plant

Ground-breaking ceremonies at Hudson, Ohio, marked the beginning of construction of a new 650,000-sq-ft manufacturing plant for the Euclid Division of General Motors Corp. To be finished by July, 1958, the plant will produce crawler tractors.

New packaging for Aljay products

Aljay Mfg. Co., Inc., Philadelphia manufacturer of weldor's clothing, is now packaging all asbestos and flame-resistant clothing, aprons, sleeves, in polyethylene bags. Leather garments are also so packed. The new packaging will help keep stock in good condition.

Hydrogen plant for Dye Oxygen

Dye Oxygen Co., Phoenix, has completed its new hydrogen plant in Phoenix. The plant is designed for easy expanion in the future.

Metallizing

ZINC metallizing has economically solved steel corrosion at American Marietta's Amseal ring shop. Steel joint rings fabricated at the shop are used to connect large concrete pipes in sewer and water lines. Metallizing protects the steel during site storage and after installation. The process permits high-speed production coating of sizes from 20-120 in. diameter. Materials were supplied by Metallizing Engineering Co., Inc. Worker is shown preparatory to metallizing. In lower left is ring.

Eutectic opens new South Dakota center

Eutectic Welding Alloys Corp., Flushing, N. Y., recently opened a new warehouse-service center in Huron, S. Dak. Located at 358 Wisconsin Ave., S. W., this facility will supply welding alloys and advisory service.

Phoenix-Rheinrohr formed in U.S.

Phoenix-Rheinrohr Corp. was formed recently with offices at 82 Beaver St., New York City. The newly elected president is Dr. Maximilian B. Bauer. The new firm is the American counterpart of Phoenix-Rheinrohr AG., Dusseldorf, Germany.

Offers welding safety hints

American Industrial Safety Equipment Co., Cleveland, is currently offering its new catalog on safety equipment, including goggles, shields, respirators, to interested persons. This publication is available *only* to safety directors.

Flick-Reedy builds plant

Flick-Reedy Corp., will occupy its new plant being built in Bensenville, Ill., in late fall of this year. A giant heat pump in the ultramodern structure $2,300,000 will squeeze heat out of quarter million cu ft of air to keep temperature at 70 F in winter. Flick-Reedy manufacturer of hydraulic, air cylinders is now in Melrose Park, Ill.

Brazing under unusual conditions

When brazing under unusual conditions, such as long heating period, high temperature, rebrazing, it is necessary to use a special flux, according to Fred J. Kelly, development engineer for General Electric's Metallurgical Products Department, Detroit.

The special flux should dissolve oxides of titanium and tantalum generally formed under these conditions, a job that cannot be done with standard fluxes. Two special fluxes have been found satisfactory, both containing either silicon or boron additives. Shelf life should be watched. Consistently good brazes, states Mr. Kelly, can be made with standard fluxes with induction heat, torch and furnace brazing, even under adverse conditions. But if oxides are allowed to form, good joints require special fluxes.

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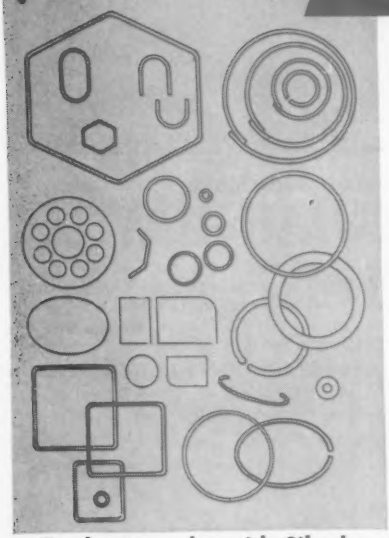

Silvaloy Silver Brazing preforms for Production Brazing. . . . Rings, stamped or coined washers, wire forms, wire, strip and powder.

Technical service men are available to assist you in the proper joint design.

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MARK A CENTER LINE *at any angle*

DIAL SET 45°

MEASURE DECLIVITY

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ESTABLISH BUTT-IN ANGLES

TO ESTABLISH AND MARK a point at any degree of angle on shaft, pipe or tube without numerous calculations or "cut and try" methods use the Boyce Centering Head. It's a must for welders, machinists, pipe fitters and boilermakers because it is *absolutely accurate* and saves time. Small enough to fit in your pocket, it weighs only 9 ounces. Order yours today or write for information.

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Boyce **CENTERING HEAD**

Brainstorming for plant expansion

Brainstorming sessions have been introduced by Tube Turns, Louisville, Ky., to formulate expansion plans. The firm is doubling the size of its main plant. "Brainstorming" describes a group creative-thinking process. At the meetings, a plant layout board with proposed buildings and machines scaled to ¼ in. is available for inspection.

Participants are urged to let their imaginations soar. All ideas are welcome; criticism is barred. Afterward, ideas are evaluated and good ones are turned over to management and engineering staffs. In 18 brainstorming sessions, Tube Turns employees have submitted a total of 799 ideas, many of which are being adopted.

Impregnator for Pakistan Railways

A pair of large welded steel tanks, forming a vacuum impregnating system said to be the largest ever built, will shortly be placed in service by the Government of Pakistan Railways at Karcahi. The equipment will impregnate armatures and field coils of diesel-electric locomotive traction motors with insulating varnish. The system was built by F. J. Stokes Corp., Philadelphia.

Ajax Engineering reorganizes

Ajax Engineering Corp., Trenton, N. J., and Ajax Electric Furnace Corp., Philadelphia, have combined. All business is being handled from Ajax Engineering Corp.

Clark Controller opens Baltimore office

A sales office in Baltimore has been opened by Clark Controller Co., Cleveland. It is located at 2319 Maryland Ave., in charge of Edward M. Hanson.

Grinding wheel to aid aircraft

A new grinding wheel developed by Electro Refractories & Abrasives Corp., Buffalo, N. Y., is expected to aid aircraft manufacturers handling high-alloy steels.

The wheel has been used successfully in the field at a midwest aircraft plant for thinning points of tools dulled in drilling alloy steels. The wheel reportedly gives the drill a cooler cut and better fields. Tests also show reduced wheel consumption.

Norton wins two awards

For the second time in two years, the Grinding Machine Division of Norton Co. has won two top industrial safety awards—the award of Massachusetts Safety Council for best safety record in heavy machinery group, and the Award of Honor from the National Safety Council.

Linde issues new welding film

Linde Air Products Co. has issued a new film covering a variety of welding processes and applications treated in a non-technical manner. "Modern methods for joining metals" was filmed at leading metal fabricating companies and Linde's laboratories. This 20-minute film is available from Linde Air Products Co., New York 17.

Learn to weld and—move earth

Students in a unique program, conducted at Braidwood, Ill., in the heart of land ruined by stripmining, by Greer Shop Training, Inc. (Chicago technical school), learn to weld and to operate earth-moving equipment. The earth-moving school, a new division of Greer, teaches students maintenance and repair, including welded repair, as well as operation of the equipment.

Welding Fittings opens L. A. office

Welding Fittings Corp., New Castle, Pa., has opened a new office in Los Angeles at 4781 E. Third St. Howard W. McNutt, the firm's western district sales manager, will be in charge. Welding Fittings produces corrosion-resistant fittings.

Distributor appointments

Adamas Carbide Corp., Kenilworth, N. J.: Oliver-Ingalls, Cleveland.

Aladdin Rod & Flux Mfg. Co., Grand Rapids: C. G. Notley & Co.; Anderson Sales Co.

Chicago Eye Shield Co., Chicago: Car-Mad Equipment Co., Belleair, Fla.

Elgin National Watch Co., Abrasives Div., Elgin, Ill: Spicer-Lindsay Associates, Denver.

Inductotherm Corp., Delanco, N. J.: Interstate Supply & Equipment Co., Milwaukee.

Metallurgical Products Dept., General Electric Co., Detroit: Henry A. Petter Supply Co., Paducah, Ky.

Westinghouse Corp., Electronic Tube Div., Elmira, N. Y.: Westlake Electronic Supply, Seattle.

MORE AND MORE men of the industry are reaching for the one acetylene cylinder designed and produced *for the industry*. Lighter weight — automatic welds — faster filling — plus greater capacity are a few of the reasons.

For details and prices write Dept. A-5 **Coyne Cylinder Company**
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WELDING ROD, ELECTRODE, FLUX RESEARCH & DEVELOPMENT EXPERIENCED PHYSICAL CHEMIST WANTED

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Our company has experienced astounding growth and offers excellent working conditions, profit sharing, incentive bonus for inventions and improvements.

Research laboratories are located in a modern plant in an attractive residential section located only 10 miles from New York City with ample living and transportation facilities.

This is a stable position offering unusual opportunity for advancement.

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EUTECTIC WELDING ALLOYS CORPORATION
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You can get important information on and inspect critically the internal arrangement of castings, welds and assemblies with MITCHELL MS Series, portable X-ray equipment. Compact MITCHELL units offer the highest possible degree of accuracy, radiographs of sharp detail and contrast and these outstanding advantages:

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The following officers have been elected by Metal & Thermit Corp: *H. H. Martin*, president; *Charles J. Beasley*, vice president and secretary; *C. Kenneth Banks, H. D. McLeese, F. J. O'Brien, Jr., B. W. Weber, Edward E. Anderson*, vice presidents; *Lawrence Eckelkamp*, treasurer.

M. Nielsen was elected president of The Babcock & Wilcox Co. recently. He succeeds *Alfred Iddles*, who is retiring after serving as president since 1948.

Edward N. Gosselin has been elected chairman of the board of Graver Tank & Mfg. Co., East Chicago, Ind. *Jalmer E. Swanson* succeeds him as president.

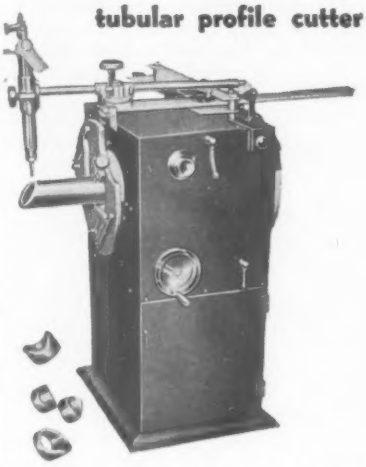
NEW Smith Welding assistant sales manager is Norwood Canfield.

Norwood N. Canfield, formerly district sales manager as well as advertising and promotion manager, has been named assistant sales manager by Smith Welding Equipment Corp., Minneapolis. He will direct all inside selling functions, including advertising, and assist in planning sales programs.

Clarence Lankenau has joined the staff of Purity Cylinder Gases, Inc., Grand Rapids, Mich. He was previously associated with National Cylinder Gas Co. for 12 years. Recently at the invitation of Ford Motor Co. he conducted welding clinics at 15 Ford assembly plants throughout the United States. He is a member of AWS.

Joseph N. Kemple has been appointed sales manager by Page Steel & Wire Division, American Chain & Cable Co., Inc. He succeeds *W. H. Bleeker*, who has retired.

woerner
tubular profile cutter



It's versatile! You can make all types of precision flame cuts on pipe or tubing with this machine; angles, miters, saddles, bevels, spiral slots, notches, cams, serrations, and many different shapes or profiles.

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Flood Always FINEST QUALITY FAIRLY PRICED

FIBER GLASS HELMET
Strong, one-piece molded shell. Lightweight. Non-warping. Heat and moisture resistant. Easy to clean and sterilize. Comes with Flood No. 14 fiber or No. P-14 all plastic ratchet-type head gear.

FACE SHIELD
Excellent protection for spot welding, grinding, buffing, acid pouring. Fiber forehead shield. Contour headgear. Easy, window replacement without tools.

Manufacturers of Welding and Industrial Safety Equipment, Including Flood's 1000-Hour Cover Lenses.
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Speed-Up WELDING
WITH SUPERIOR'S BENCH MODEL
POSITIONER-TURNTABLE

Complete with Foot-Control Switch

Weighs 20 Lbs.

LOW PRICE • HIGH QUALITY

Holds work in any position from vertical to horizontal and will carry 100-pound load.

Smooth, stepless speed change, both forward and reverse, from zero to 6 rpm—greater speed if desired. Ideal for aircraft work.

Reduces rejects—increases output up to 25%. Gear driven motor, v-belt transmission with tension control, built-in ground for more uniform welds.

Good Distributor territories still open • Write for details

For additional information, write or wire to:

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"ROYAL"
CASE-HARDENING POWDER

- More effective than cyanide. Gives off no dangerous fumes. Simplifies the work. Economical to use.
- Makes low-grade steel perform like high-grade steel.
- Enables the weldor or blacksmith to produce a finer cutting tool with technical equipment.
- Produces a .01 to .02 in. case depth with necessary Brinnell toughness on large and small low-carbon steel tools and parts.
- Write for sample and descriptive booklet.
- Manufactured by the makers of "E-Z", & "Crescent", Welding Compounds and "Anti-Borax" Oxy-Acetylene Welding and Brazing Fluxes.

ANTI-BORAX COMPOUND CO., INC.
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Pierce

Iverson

The following sales appointments have been made by Alloy Rods Co., York, Pa.: *John Pierce* has been transferred to a territory in southern California, with headquarters at El Segundo; *Einar Iverson* has been appointed to the Chicago territory formerly serviced by Mr. Pierce.

Fred H. Lewis has been named assistant general manager, Cylinder Gas Division of Air Products, Inc., Allentown, Pa.

The following appointments were made at the Sault Ste. Marie plant of Electro Metallurgical Co., a division of Union Carbide & Carbon Co.: *H. A. McPherson*, superintendent, to assistant to works manager; *J. H. Smallridge* superintendent; *S. L. Slater* to assistant superintendent of both power and calcium carbide operations.

W. W. Whitley has been named district manager of the Atlanta office of Southern Oxygen Co. Under Mr. Whitley's supervision this district will enter the welding equipment and supplies field, covering Georgia, South Carolina and northern Florida. He is an AWS member.

Whitley

Peter J. Prevas has been named assistant plant superintendent of Arcrods Corp., Sparrows Point, Md. An AWS member, Mr. Prevas, with Arcrods since 1946, was formerly a process engineer.

Wallace E. Carroll has been appointed director of the Metalworking Equipment Division of Business & Defense Services Administration, U. S. Department of Commerce. He is president and treasurer of American Gage & Machine Co. He will serve for a six-month period. He succeeds *J. Robert Jones*, vice president of sales, Kearney & Trecker Co., who has returned to his firm.

Choose Huntsman angle-shape for
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- better top-of-head protection
- easy fit in your toolbox
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Specify the complete line of quality-built, guaranteed products

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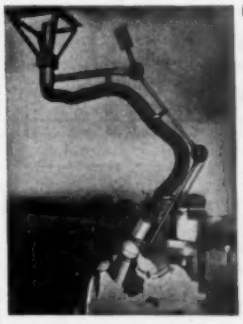

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- Portable and stationary units for all applications.
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- Blowers can be attached to units or mounted at remote points connecting with ductwork.
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Available in 9, 12, or 16 foot reach units.

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M. J. Wurzbach has been appointed to the new post of staff director, product information, of United States Steel Corp., with headquarters in Pittsburgh. *Alan G. Ingraham* has been appointed manager, alloy sales, USS supply division. In the sales department *M. M. Chapman* was named assistant vice president of sales and distribution and *John R. Johnston*, assistant vice president of sales and solicitation. *John H. Morava* was recently named president of USS Steel Supply Div. He succeeds *Leslie B. Worthington*, recently named president of the Columbia-Geneva Steel division, San Francisco. *James F. Trad* has been named manager of sales for the Chicago district sales office, succeeding Mr. Morava.

Wilbur H. (Bill) Cobb has joined the staff of Allied Welder Corp., Dearborn, Mich. He was formerly associated with Progressive Welder Co. for 20 years, most recently in sales engineering. He will serve as liaison between engineering and sales departments.

Cobb

R. A. Wendorf has been named sales manager of the Automotive Division, A. O. Smith Corp., Milwaukee.

Died . . .

Lew Gilbert, publishing director of *Industry & Welding*, died Friday, April 12, after a short illness. He had recently been hospitalized but was in his Cleveland office when stricken. Mr. Gilbert had only recently been promoted from his former post of executive editor. He is survived by his widow, Louise, and three sons.

George A. Fyrberg, production manager of Norton Co.'s Abrasive Division, died suddenly April 6. Joining Norton Co. in 1915, he was appointed production manager in 1952.

William B. Keelor, president of Keelor Steel, Inc., Minneapolis, died March 25 from injuries received in a fall while horseback riding. Entering the welding industry with the Whiting Corp., he later established a fabricating shop and, at the time of his death, headed the welding supply business and steel warehouse which he founded.

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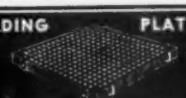

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51. CARBIDES—Allegheny Ludlum Steel Corp. Series of 15 new Blue data sheets cover "Carmet" carbide grades. Sheets are keyed with bands of different colors to indicate grade's function, for example, blue for non-ferrous and cast iron. Individual sheets on particular grades or uses also available.

52. SOLDER, FLUXES—Anchor Metal Co., Inc. 4-page 8½ by 11 in. folder (Cat. No. 57-A) describes bar solders, acid core solder, and fluxes.

53. INDUCTION HEATING—Lepel High Frequency Laboratories, Inc. Attractive 38-page catalog covers heat treating, metal joining, annealing, stress relieving, brazing, hardening.

54. POSITIONER—Aronson Machine Co. 16-page bulletin No. UB57 features the universal balance positioner, treating five models with drawings and accessories.

55. AUTOMATIC SOLDER—Castle Machines, Inc. Illustrated 4-page brochure discusses "Braze-O-Matic" automatic soldering machine, can be used on aluminum and powdered metals.

56. BRAZING—Western Gold & Platinum Works. Illustrated 4-page leaflet covers boats, slabs, crucibles and special fixtures for brazing, sintering, melting and heat treating.

57. HARDFACING—The McKay Co. Two bulletins treat the "Frogalloy M" and "C" electrodes and nickel-manganese low-hydrogen electrodes—all for hardfacing.

58. MAGNETS—General Electric Co. 12-page catalog PM-121 (supersedes catalog PM-100) covers cast and sintered permanent magnets: properties, tolerances, tips on use and how to order.

59. CONVEYOR BELT—Raybestos-Manhattan, Inc. New catalog 25 CB treats conveyor and elevator belts, including line of hot-material belts for 150-350 F and grain belts for oily and non-oily whole or cracked grains.

60. THERMOPLASTICS—American Agile Corp. 8-page equipment and semi-finished component section (addition to general catalog) includes discussion of mobile thermoplastic spray, fluidizing unit and plastic coating unit.

61. WELD INSPECTION—Nuclear Systems. 17-page booklet covers weld inspection and non-destructive testing by gamma radiography.

62. HAND CHISELS—Bedford Tool & Forge Co. 16-page catalog covers hand and pneumatic chisels, with illustrations.

63. FINISHING — Bay State Abrasive Products Co. 4-page brochure covers abrasive finishing, deburring with "Gritcloth" sheets, discs, rolls.

64. MEASUREMENT — The Bristol Co. Bulletin OP1503 discusses recorders; bulletin P1270 treats potentiometer; bulletin P1245A describes pyrometers.

65. WELDERS—Mid-States Welder Mfg. Co. Catalog sheet (ML-103) discusses "Missing Link" automatic arc stabilizer for Mig, Tig welders; three-in-one welding unit for spot arc, Tig and Mig welding is subject of sheet SP 13-755; "Bulldog" welders for a-c arc welding is treated in illustrated sheet.

66. RESISTANCE WIRE — Driver-Harris Co. Technical bulletin 157 covers physical and electrical properties of fine resistance wire, bright and enameled.

67. FACE SHIELDS — Pulmosan Safety Equipment Corp. Illustrated page describes face shields for weldors.

68. TACHOMETERS—Herman H. Sticht Co., Inc. Bulletin 1048 contains complete data on tachometers for variety of speed measurements.

69. MULTI-SPOT WELDERS — National Electric Welding Machine Co. Illustrations accompany discussion of four multi-spot welders for complex assemblies in "Welding News" (Vol. 10 No. 5).

70. VALVES—Ross Operating Valve Co. Bulletin 303B (illustrated) discusses "600" and "880" series hand and foot-operated valves, for air and other service.

71. SOFT SOLDER—Aladdin Rod & Flux Mfg. Co. Circulars provide data on soft soldering kit (containing silver), soapstone pencil and refills, soft silver solder.

72. HOOK-UP WIRE—Philadelphia Insulated Wire Co. Two illustrated data sheets treat hook-up wire: "100" for 600 volts at -60 to 200 C; "110" for use where high temperatures, low temperature flexibility, are factors.

73. STEEL GUIDE—Jos. T. Ryerson & Son, Inc. Handy pocket-size folder is a guide to maintenance steels and allied products. It is designed as help in purchase.

74. INSULATION COATING — Lovell Chemical Co. Handy pocket-size 4-page booklet describes "No-Short" liquid insulating coating for electrodes, horns, holders, seam welding wheels and arms. Applied by dipping or brushing directly.

75. GRINDING WHEELS—Simonds Abrasive Co. General purpose grinding wheels, "Borolon" and "Electrolon" bonded, are subject of folder (File 8-1) (No. ESA141).

76. STEEL WELDING—Crucible Steel Co. of America. 24-page booklet is a helpful aid to welding stainless steel entitled "The joining of Crucible Rezistal stainless steels."

77. BRAZING—Handy & Harman. Literature discusses new self-fluxing brazing alloy "Alumibraze" for joining aluminum alloys, applied as aqueous slurry, designed for use in molten salt bath.

78. WELD INSULATION—American Machinery & Chemical Co. Folder treats new "Amaza" spot welding insulation, in final form a smooth, hard blanket of plastic able to withstand intense welding.

79. CABLE KIT—Cam-Lok Division. 4-page catalog 131 contains complete data on new cable connection kit and accessories.

80. POSITIONERS—Pandjiris Weldment Co. Data and specifications for welding head manipulators, turning rolls, positioners and special fixtures are provided in catalog 8155.

81. SNAGGING WHEEL—Simonds Abrasive Co. Descriptive bulletin covers new "DA Borolon" abrasive used in snagging wheels for longer wear and sharper cutting.

82. ELECTRODE HOLDER — Martin Wells Inc. Bulletin T 956 describes the new "Tong-Grip" electrode able to deliver 300 amp on heavy-duty cycle connected to 00 cable.

83. HOSE REEL—Clifford B. Hannay & Son, Inc. Literature describes new dual hose reel for oxyacetylene welding hose. Catalog H111LP treats line of hose reels for LP-gas delivery equipment.

84. METALLIZING—Metallizing Co. of America. Bulletin 3903 discusses "Mogul" metallizing gun; bulletin 3705 discusses metallizing equipment, including dot welding machine.

85. WELD INSPECTION—Turco Products, Inc. 4-page folder "How to perform dye penetrant inspections" covers use of "Dy-Chek" with emphasis on weld inspection.

86. FACE SHIELDS—Jackson Products. Catalog sheet is complete discussion of new "Musketeer" headrest with choice of four types of face shield visors.

87. PUNCH PRESS—Alva Allen Industries. Literature provides specifications and descriptions of new model "BD-3" 3-ton bench, deep-throat punch press for shearing, cutting, punching metal, plastics, etc.

88. INDUSTRIAL X-RAY—Machlett Laboratories, Inc. 4-page discussion covers tubes for metalworking industry.

89. SAFETY SHOES—Safety Box Toe Co. 4-page brochure describes "Winguard" steel toe safety shoes.

90. WELDER CONTROL—Weltronic Co. Brochures B-241 and B-245 cover digitronic spot welder control and 3-hp adjustable speed motor drive.

91. RADIOGRAPHY—Balteau Electric Corp. Illustrated sheet details construction and use of "Baltospot 200" lightweight X-ray unit.

92. TIG TORCH—Tec Torch Co., Inc. Color-illustrated folder discusses the "Visuweld" torch for Tig (tungsten inert-gas) welding. Special feature is the transparent nozzle for clear view of weld.

93. HARDFACING—L & B Welding Equipment, Inc. Illustrated 4-page brochure covers new automatic oxyacetylene hardfacing machine "Optiflame Model D."

94. WELDING SHIELD—Frommelt Industries, Inc. Literature treats "Spa-Fla" portable welding shield, easily rolled and carried. Sample swatch available for test purposes.

95. STUD WELDING—Nelson Stud Welding Division. 24-page design manual contains tips on how to take fullest advantage of stud welding. Includes various stud types and new "CP" stud for use where straight threaded stud is required.

96. INDUCTION HEAT—Inductotherm Corp. Economy and efficiency of "Inducto Push-out" furnace (a removable crucible furnace) is subject of latest "Metal Melting Newsletter" (No. 3).

97. ZIRCONIUM—Carborundum Metals Co. "More ZR Facts" is 8-page booklet discussing zirconium's challenge to corrosion in chemical processing and nuclear reactors.

98. BLAST CLEANER—Vacu-Blast Co., Inc. Bulletin D-1 details the "AeroVacu-Blaster" blast cleaning machine with vacuum pick-up

99. ELECTRODE HOLDER—Bernard Welding Equipment Co. 4-page folder describes "Shortstub" electrode holders.

100. HEATING ELEMENTS—The Carborundum Co. 12-page (Form A-1472) booklet covers silicon carbide heating elements—handling, storage, installation.

101. LOW TEMP ALLOYS—The International Nickel Co., Inc. Booklet entitled "Some properties of Inco nickel alloys at low temperatures" describes various wrought and cast high-nickel alloys.

102. HEAT TREATING—Surface Combustion Corp. Illustrated bulletin SC-175 discusses available types of furnace for heat treating: brazing, hardening, annealing, sintering.

103. SHIELDS GOGGLES—The Fibre-Metal Products Co. Bulletin 41 discusses "Monarch" face shields; bulletin No. 53 treats the head rest "Sologoggle"—a goggle, headpiece combination.

104. HARDFACING—The Sight Feed Generator Co. "Rexarc engineered toughness" is a 20-page manual on hardfacing and manganese electrodes. Procedure section illustrates typical buildup and hardfacing applications with recommended procedures.

105. INSTRUCTION—Eutectic Welding Alloys Corp. Reprint of 56-page illustrated Eutectic Welding Institute manual (TIS 2572) is reference for modern welding and repair procedures. There are many diagrams and photos as an aid to the weldor.

106. PLASTIC PIPING—Haveg Industries, Inc. 32-page catalog covers corrosion-resistant plastic equipment including pipes and fittings, valves, fume ducts and systems, tanks, heat exchangers and special tools for working with plastic equipment.

107. VOLTAGE REGULATOR—General Electric Co. Descriptive data is supplied in two new booklets on step voltage regulators: GEA-5752C on single-phase ratings; GEA-6552 on three-phase ratings. Both brochures plus one on induction feeder regulators are included in single package "Your guide to profitable voltage regulators" GED-3133.

108. BRAZING—Handy & Harman. Booklet treats course offered, free, on fundamentals of silver alloy brazing. Bulletin 17 covers brazing fittings to pipe and tubing using "Easy-Flo" and "Sil-Fos" silver alloys.

ADVERTISERS IN THIS ISSUE

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If you wish to receive any of these items listed here, use card on opposite page.

125. Air Reduction Sales Co.—Complete information and literature on "Airco" flame-cutting machines.

126. Air Reduction Sales Co.—Data on 3 new "Airco" manual Heliweld holders for greater flexibility in Tig arc welding.

127. Air Reduction Sales Co.—Catalog 1318, "Airco Electrode Guide" to help you select the right electrode for your specific job.

128. Air Reduction Sales Co.—Details on "Airco's" complete line of stainless steel electrodes.

130. Alloy Rods Co.—Bulletin AR-10, the selector guide to superior quality stainless steel weld metal.

131. All-State Welding Alloys Co., Inc.—Data for selection of alloys and fluxes to weld, braze and solder aluminum and "Aluminum Chart."

132. American Brass Co.—Publication B-13 and information on the selection of the exact rod for your job.

133. American Manganese Steel Div.—Information and technical data on "Amsco" tube rods and "MF" semiautomatic welder.

134. American Messer Corp.—Information on tonnage oxygen and nitrogen for steel and chemical processes and oxy-acetylene cutting machines.

135. American Optical Co.—Information on hand protection for weldors with "Drednaut" gloves and mittens.

136. American Platinum Works, Inc.—Fluxing manual, "A Complete Guide To Selective Fluxing For Low Temperature Silver Brazing."

137. Ampco Metal, Inc.—Information on "Ampco-Braz #1" non-fuming, low-melting-point filler rod for attractive high-strength welds.

138. Anti-Borax Compound Co.—Sample and descriptive booklet on "Royal" case-hardening powder.

139. Arcos Corp.—Details on stainless electrodes.

140. Arcos Corp.—Information on chrome-moly electrodes.

141. Aronson Machine Co.—Detailed information on positioners.

142. Atlas Welding Accessories, Inc.—Data on complete weld-cleaning tool line.

143. Belden Mfg. Co.—Details on magnet wire and welding cable.

144. Burdett Oxygen Co.—Details and "Burdox Catalog" on welding and cutting equipment.

145. Champion Rivet Co.—Catalog 57-A describes welding electrodes in new containers.

146. Chicago Eye Shield Co.—Complete catalog on welding helmets, face shields and other safety products and name of nearest "Cesco" distributor.

147. Chicago Hardware Foundry Co.—Data on "Fuse-Well" cast-iron welding rods and electrodes.

148. Contour Marker Corp.—Information and instruction book on laying out pipe joints.

149. Contour Marker Corp.—Details on establishing and marking a point at any angle.

150. Coyne Cylinder Co.—Details and prices on acetylene cylinders.

151. Crescent Co., Inc.—Information on "Carol Dynapower" arc-welding cable.

152. Crucible Steel co.—Details on how automatic welding wire gives faster cleaner, sounder welds; saves you time and money and can help you with your welding problem.

153. Dockson Corp.—Catalog on complete line of goggles and name of your nearest distributor.

154. Drawalloy Corp.—Bulletin 355-DC provides complete information on every grade of Drawalloy wire.

155. Engwald Corp.—Application data on welding-fume exhausters.

156. Essex Welding Equipment Co., Inc.—Details on "Aridair" stablizer to stablize electrode moisture content.

157. Eutectic Welding Alloys Corp.—Details on "Xyron 2-25" electrode for all types of grey and alloyed cast-iron and 170-page pocket, "Welding Data Book."

158. Eutectic Welding Alloys Corp.—Information on "EutecTrode 2101" aluminum electrode with extruded flux coating for high-strength joints.

159. Eutectic Welding Alloys Corp.—Data on "EutecTrode 680" a-c/d-c high-tensile electrode and "Eutec-ChamferTrode" high-speed gouging electrode.

160. Federal Machine & Welder Co.—Details on "Federal-Warco Packaged" metal-working lines of automated production.

161. Fibre-Metal Products Co.—Bulletin 41 on "Monarch F-300" face shield and other safety equipment.

162. Flood Safety Products Co.—Data on heat and moisture resistant No. 14 fiber glass and No. p.14 all-plastic ratchet-type helmets.

163. General Electric Co.—Descriptive Bulletin GEA-6423 on new d-c motor-generator welding sets.

164. General Electric Co.—Data on new cost-cutting, non-synchronous controls for resistance welding applications.

165. General Electric Co.—Information and Bulletins GEA-6408 (Standardline) and GEA-6593 (Customline).

166. Goldsmith Bros. Smelting & Refining Co.—"GB Data Book" gives complete information on low-temperature silver-brazing.

167. H & M Pipe Bevling Machine Co.—Fully illustrated details on the complete H & M line.

168. Handy & Harman—Bulletin 20 describes high-strength, speed and economy of "Easy-Flo" silver brazing and details joint design and fast brazing methods.

169. Harnischfeger Corp.—Bulletin R-29, "P&H Smootharc Welding Electrodes," gives full description and specification data of iron-powder electrodes.

170. Harnischfeger Corp.—Information on "P&H" iron-powder, low-hydrogen electrodes.

171. Harrisburg Steel Co.—Data on complete range of sizes and capacities of export and domestic types of gas cylinders.

172. Harris Calorific Co.—Complete information to answer all your questions about gas welding and cutting equipment.

173. Haynes Stellite Div.—Descriptive booklet, "Haynes Hard-Facing Alloys in Coils."

174. Hobart Bros. Co.—Information on a-c/d-c combination, electric motor drive, standard gas engine drive and d-c rectifier welders.

175. Hobart Bros. Co.—Details on "Husky Boy" air-cooled, a-c welder/a-c power combination and "Contractor's Special" welders.

176. Hobart Bros. Co.—Data on automatic and semiautomatic welders, a-c transformer and iron-powder electrodes.

177. Hobart Bros. Co.—Information and samples of new "Rocket 14" all-position, iron-powder electrodes.

178. Hobart Bros. Co.—Complete catalog on electrodes and catalog on arc welding machines.

179. Independent Engineering Co., Inc.—Details on how to reduce cylinder handling with gas supply trailers.

180. International Nickel Co., Inc.—Illustrated and informative, "Handy Guide to Welding Cast Irons," contains stories of successful welding, technical data and tips on production work and emergency repairs.

181. Invincible Vacuum Cleaner Mfg. Co.—Folder, "Invincible Flux Recovery Systems."

182. Jackson Products—Details on ground clamps, cable connectors, splicers and lugs for welding profits.

183. K-G Equipment Co., Inc.—Literature describing "On Guard" regulators.

184. KSM Products, Inc.—Data on stud welding for end welding fasteners.

185. Kaiser Aluminum & Chemical Corp.—Informative folder, "New Advantages in Arc Welding with Aluminum Welding Cable."

186. Kedman Co.—Information on welding helmets, face shields and accessories.

187. Lenco, Inc.—Information on "Hi-Amp" electrode holders.

188. Lewis Welding & Engineering Corp.—Bulletin 6960 gives details and prices on automatic welding head manipulators.

189. Lincoln Electric Co.—Complete information about "Cooltong" electrode holders.

190. Linde Air Products Co.—Details on "Purox W-200" welding blowpipe.

191. Linde Air Products Co.—Booklet on how "X-7" anti-spatter compound saves time and cuts costs.

192. Liquid Carbonic Corp.—Complete particulars on new "Liquidweld" line of gas welding equipment and regulators.

(Continued on page 124)

WELDING INFO-AIDS

USE THIS CARD for Literature, Catalogs, and Bulletins shown on preceding pages and for those featured in this month's ads as listed opposite and on following page.

Also information about

NEW PRODUCTS described on pages 90 to 106

Every month WELDING ENGINEER lists many new catalogs and bulletins available from manufacturers. All are yours for the asking. However, this service is valuable to you only if you use it.

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Literature offered in ads

(Continued from page 122)

193. Magnaflux Corp.—Full details on nation-wide commerical inspection service.

194. Mallory & Co., Inc., P. R.—Details on broad line of electrodes to help solve your special resistance welding problems and name of nearest distributor.

195. Merrill Bros.—Information on testing systems that can save money and improve the quantity and quality of your welding.

196. Metal & Thermit Corp.—Information on faster welding with "M&T Speedex" iron-powder electrodes for general use and low-hydrogen electrodes for hard-to-weld steels.

197. Metal & Thermit Corp.—Full details on "M&T Controlled Arc Power Supply" and catalog on "Hardex" line of electrodes and hardfacing materials.

198. Miller Electric Mfg. Co., Inc.—Details on weatherproof, rugged and ready mobility of "AEA-200-L" a-c welder instantly adaptable to power plant and pipe thawer.

199. Miller Electric Mfg. Co., Inc.—Complete specifications and data on new "Multi-Arc" a-c/d-c combination welder.

200. Mitchell Radiation Products Corp.—Details on portable industrial X-ray equipment.

201. National Carbide Co.—Write for name and address of nearest supplier.

202. National Cylinder Gas Co.—Complete catalog on "Torchweld" regulators and line of welding and cutting equipment.

203. National-U.S. Radiator Corp.—Technical data and working sample of "Plast-Iron" Grade B-171 powder for mild steel, low-hydrogen and hardfacing electrodes.

204. National Welding Equipment Co.—Brochure on cutting torches, "flame cutting—here's how it works."

205. Nickelson Tool & Die Co., Inc.—Descriptive folder on "Woerner" tubular profile cutter.

206. Norris-Thermador Corp.—Specifications and sizes of acetylene cylinders.

207. Oerlikon Machine Tool Works—Detailed information on Oerlikon welding electrode production equipment.

208. Page Steel & Wire Div.—Folder DH-402A on submerged-arc and inert-gas welding wire.

209. Page Steel & Wire Div.—Booklet DH-1277 on gas welding rods and welding rod comparison chart.

211. Phoenix Products Co.—Information on "Dry-Rod" electrode ovens.

212. Picker X-Ray Corp.—Details on X-ray units, gamma radiography, inspection cabinets and accessories.

213. Rankin Mfg. Co.—Complete information and "Comparison Chart" on "Ranite" hardfacing welding rods for every type application.

214. Robotron Corp.—Information bulletin, "Electronics and you," on electronic controls.

215. Smith Corp., A. O.—Data on weldor-proved electrodes, machines and accessories and how they can be used to your advantage.

216. Square D Co.—Details on how field engineer is backed by a complete line of performance-proven electrical equipment with which to put practical planning into action.

217. Steel Sales Corp.—Data on "Silvaloy" silver-brazing preforms for production brazing, rings, stamped or coined washers, wire forms, wire, strip and powder.

218. Stulz-Sickles Co.—Information on "Manganal" manganese-nickel steel special-shape applicator bars.

219. Superior Welding Co.—Details on distributorships and information on how bench model Positioner-Turntable speeds-up welding.

220. Sylvania Electric Products, Inc.—Information on Tig electrodes for any inert-gas welding job.

221. Taylor-Winfield Corp.—Data on electric resistance and arc-welding machines for your weld production requirements.

222. Tempil Corp.—Information on, and sample pellets of, temperature indicators.

223. Tennessee Fabricating Co.—32-page catalog, "Everything For The Ornamental Iron Shop."

224. Thermacote Co.—Details on "Thermo" spiral tip cleaners and free sample.

225. Tillman & Co., John—Catalog on weldor's gloves and garments.

226. United States Steel Corp.—Complete information about the application and fabrication of USS "T-1" steel.

227. Vickers Electric Div.—Information on versatile "Controlarc" d-c welder.

228. Victor Equipment Co.—Literature and demonstration on combination welding and cutting units.

229. Westinghouse Electric Corp.—Information on new custom "Silver W" a-c or d-c high-frequency welder with remote control.

230. Westinghouse Electric Corp.—Details on new "Phos-Silver-6M" brazing alloy and complete line of brazing materials.

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TUNGSTEN ELECTRODES
MANUFACTURED BY SYLVANIA ELECTRIC PRODUCTS INC., TUNGSTEN & CHEMICAL DIVISION, TOWANDA, PA., U.S.A.
• 2% THORIATED RED END
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There's a Sylvania Tungsten Electrode

for any inert-gas welding job!

Only Sylvania has the complete line of tungsten electrodes for shielded arc welding! Whether you use argon, helium, or atomic hydrogen—the four dependable Sylvania electrodes will effectively meet almost any condition you may encounter.

For greater economy, safety, and convenience—Sylvania Tungsten Electrodes are color-coded. You can tell the type of rod merely by glancing at the end. Partially used rods, regardless of length, no longer need to be scrapped for lack of identification. And no longer do you risk ruining a costly job because of choosing the wrong electrode.

Sylvania electrodes break clean, too. No jagged edges! No splitting!

Supplied with chemically cleaned or centerless ground finish, Sylvania Tungsten Electrodes are available in handy packages of ten through all leading distributors. For further information, see your welding supplies distributor or write to:

SYLVANIA ELECTRIC PRODUCTS INC.
Tungsten and Chemical Division, Towanda, Penna.

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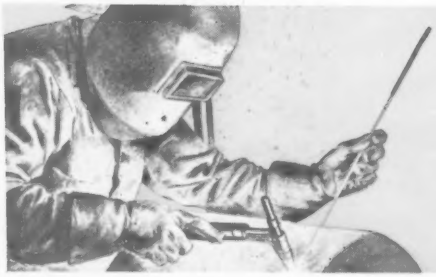


WELDING ROD CLINIC

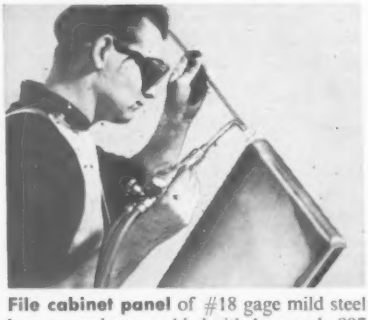
J. Imperati and R. F. Pulver, Welding Engineers
The American Brass Company, Waterbury, Conn.

Steel products are quickly, economically assembled by Braze Welding

Velocipede frame of 2″ mild steel tube braze welded with ⅛″ Anaconda-997 (Low Fuming) Bronze Welding Rod. The quickest, most dependable and economical method of joining steel tubing says manufacturer, The Frank F. Taylor Co.

Many articles of steel in widespread use are, or can be, economically assembled by oxyacetylene braze welding. Typical of one group are items made of round and square tubing, such as school and office chairs, equipment handles, and frames for bicycles and wheeled toys, portable generator sets, and motor scooters. Another group uses sheet metal, formed moldings, rods, castings, and forgings to make cabinets and enclosures for sinks, refrigerators, files, etc., office furniture, wrought-iron furniture and decorative items, storm sash and screen frames, auto-body parts, and others.

Advantages. The advantages of braze welding are fully realized by the use of Anaconda-997 (Low Fuming) Bronze, Tobin Bronze-481 and Nickel Silver-828, because of the low temperature of application, excellent control, and the simplicity of joint and jig design needed for efficient production. Since the low temperatures do not melt the steel, the weld metal is very easily controlled, and there is no need for skilled manipulation of welding rod and flame, as in fusion welding. In addition, there is less tendency to distort the work because of the low temperatures used and the excellent ductility of the weld metal.

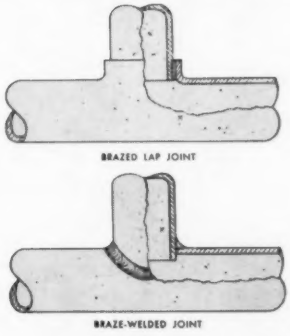


File cabinet panel of #18 gage mild steel has corners braze welded with Anaconda-997 Rod. Revo-File Co. gets 14 superior welds in 7 minutes.

Simple jig design. In most cases the joints are of such size that they can be made in a single step by heating from one side only. This simplifies jig design and reduces handling operations.

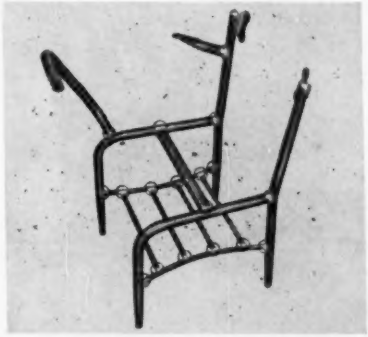
Savings in joint preparation. The molten braze-welding alloys easily bridge the gaps resulting from poor fit-up, and readily build up smooth fillets to develop maximum joint strengths. The cost of joint preparation is minimized since there is no need for accurate fit-up.

ANACONDA®
WELDING RODS
Made by
The American Brass Company



Flame fluxing. A widely used adjunct to braze-welding operations is a vapor-fluxing device, installed in the fuel-gas line, to supply a uniform small amount of flux through the flame. In this way, the joint surfaces are protected from oxidation just as soon as heating is started, and the braze-welding operation is expedited through complete fluxing, increased weld fluidity, less tendency to fume, and elimination of separate fluxing operations.

For More Information. Anaconda distributors will gladly help in the selection of the exact rod for your job. Or write for a copy of new Publication B-13. Address: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont. 87111



School furniture. With Anaconda-997 Rod, Peabody Seating Co. gets 18 well-shaped braze welds for each chair in about 8 minutes.